BRITISH MEDICAL JOURNAL

LONDON SATURDAY JULY 8 1939

SLEEP: NORMAL AND PATHOLOGICAL*

BY

W. RUSSELL BRAIN, D.M., F.R.C.P.

Physician with Charge of Out-patients to the London Hospital; Physician to the Maida Vale Hospital for Nervous Diseases

The Nature of Sleep

"Sleep," says Dr. Johnson, "is a state in which a great part of every life is passed. . . . Yet of this change, so frequent, so great, so general, and so necessary, no searcher has yet found either the efficient or final cause; or can tell by what power the mind and body are thus chained down in irresistible stupefaction." Considering the problems which sleep presents to the physiologist, the physician, and the psychiatrist, it is surprising how true this still is, and how varied are the views held concerning its nature. Nevertheless, much has been learned during recent years, and though large gaps in our knowledge remain we know enough to be able to trace some at least of "the efficient causes" of sleep, and of its strange disturbances, which are surely among the most bizarre of nervous disorders.

Some species of animal sleep for several short spells during the twenty-four hours, others for one long spell. Szymanski (1918a, 1918b, 1919) made the interesting observation that the polyphasic sleepers are animals which depend on tactile or olfactory senses for obtaining food, as do the earthworm and rabbit. Animals which depend on visual stimuli, such as the dog, are monophasic sleepers. The human infant is polyphasic at first: it becomes monophasic as its diet changes from a tactile and olfactory to a visual stimulus.

During sleep not only is consciousness lost but certain bodily changes occur. The pulse rate, blood pressure, and respiratory rate fall; the eyes usually deviate upwards, the pupils are contracted but continue to react to light, though slowly; the tendon reflexes are abolished and the plantar reflexes may become extensor. Since we know that the conscious perception of all except the cruder forms of sensation is a function of the cerebral cortex it is a reasonable inference that during sleep the activity of the cerebral cortex is depressed. This view has been confirmed by the study of the behaviour of cortical electrical rhythms during sleep by means of electro-encephalography (Walter, 1938). Five stages have been recognized in the process of falling asleep. Briefly, as sleep deepens there is a transition from the normal alpha waves, which are recorded from the occipital lobe in subjects with the eyes closed, through a phase of bursts of more rapid waves to the development of slow random waves known as delta waves, of a type present in various conditions in which the cerebral cortex is in a state of profound inactivity.

How is this cortical inactivity brought about? Pavlov (1928) put forward the view that sleep was identical with internal inhibition. His reason for this was that in certain animal experiments on conditioned reflexes the animal would fall asleep during a stage of the process which Pavlov considered to be a phase of internal inhibition. He therefore concluded that sleep was due to the spread of inhibition over the cortex. This hypothesis, however, may be criticized on the ground that even if sleep coincides with internal inhibition it is not necessarily identical with it. For example, if there is a waking centre—a question I shall discuss shortly—the extension of inhibition to the waking centre might produce sleep without sleep necessarily being identical with an extension of inhibition over the whole cortex. Kleitman (1929) proposes a different view—namely, that sleep is an easily reversible inactivity of the highest functional centres of the cortex which is due to a functional break resulting from a decrease in afferent impulses from the sensorium, especially from the proprioceptors stimulated by muscle tonus. Electro-encephalography perhaps affords some support for this view, for Bremer (1937) states that in an animal decerebrated by transection of the brain-stem the electro-encephalogram of the cerebral cortex is identical with that found during normal sleep.

There is both experimental and clinical evidence for the existence of a centre concerned with the regulation of sleep and waking, and situated in the posterior part of the hypothalamus.

It has repeatedly been shown that lesions in this region, especially between the corpora mammillaria and the nucleus of the third nerve, and involving the efferent path from the hypothalamus, cause pathological somnolence in animals (Ranson, 1939.) Lesions produced in man by disease, being usually more diffuse, are of less localizing value, but the sleep disturbances characteristic of epidemic encephalitis lethargica can be correlated with the predilection of the virus of this disease for the grey matter around the anterior end of the aqueduct of Sylvius, and intracranial tumours are most likely to produce somnolence when they are situated in the interpeduncular space. Since destruction of this region causes somnolence it would perhaps be more aptly described as a waking centre rather than a sleep centre. Fulton (1938), on anatomical grounds, stresses the probable importance of the corpora mammillaria because of their heavy projection to the thalamic nuclei and hence their close link with a most important relay station on the path of afferent impulses towards the cerebral cortex. No part of the normal nervous system, however, acts in isolation, and normal sleep is the outcome of an interplay between the cerebral cortex and the hypothalamic sleep-waking centre.

Hypersomnia

Disease of the brain more often causes prolonged sleep than abnormal wakefulness. Sleep which is abnormally prolonged and from which it is more than normally difficult to arouse the patient is known as hypersomnia. As already mentioned, this is usually the result of lesions situated roughly between the corpora mammillaria and

* An address delivered to the Osler Society of the University of Oxford.

the nucleus of the third nerve. The state of the patient suffering from hypersomnia closely resembles that found in normal sleep. Even at the first glance the healthy colour, tranquil facies, and quiet, somewhat shallow breathing distinguish hypersomnia from states of coma in which the functions of the cerebral cortex are more profoundly disordered and not merely in abeyance through the overactivity of a natural mechanism. As in normal sleep, the eyelids are closed, the pupils contracted, and the limbs relatively toneless. The tendon reflexes may be diminished or lost and the plantar reflexes may be extensor. The patient can always be aroused to some extent by vigorous stimulation, and when thus aroused may reply rationally to questions and will usually swallow food. When the pathological sleep is deep, however, the response may be very limited, but even so it is more normal than that of a patient in coma. For example, a publican in a state of profound hypersomnia from which nothing else would arouse him still responded with a smile when offered a drink. Walter, Griffiths, and Nevin (1939) state that in a case of pathological somnolence due to tumour of the hypothalamus the electro-encephalogram resembled that found in deep natural sleep and could be differentiated from the electro-encephalograms both of ether anaesthesia and of coma due to increased intracranial pressure.

Narcolepsy

"Narcolepsy" is the term applied to sleep which is abnormal by reason of its onset being sudden and irresistible, though the circumstances may be inappropriate and excessive fatigue is absent; but narcolepsy differs from hypersomnia in that the patient can be aroused from the narcoleptic attack as from normal sleep. A few writers have regarded narcolepsy as a condition allied to epilepsy rather than as a form of sleep disturbance. Nevertheless the patient who suffers from narcolepsy is apt to suffer also from other forms of sleep disturbance. There are at least five different sorts of disturbance of the sleep mechanism which are mutually related, one or more being found in the same individual. These are narcolepsy, cataplexy, sleep paralysis, somnambulism, and sleep hallucinosis.

The irresistible attacks of sleep characteristic of narcolepsy may be very numerous, occurring many times a day. In the attacks the patient rapidly becomes unconscious, but the condition resembles normal sleep in that he can be aroused immediately by appropriate stimuli. The attacks are most likely to occur in circumstances normally conducive to drowsiness, such as after a heavy meal or during a monotonous occupation, especially when driving a car, and are usually worse in the afternoon. They are occasionally precipitated by strong emotion. The sleep is usually brief, lasting only for seconds or minutes, but if the patient remains undisturbed he may sleep for hours.

Cataplexy and Sleep Paralysis

By cataplexy is understood an attack to which sufferers from narcolepsy are liable, but which differs from sleep in that, though the patient suddenly loses all power of movement and of maintaining posture, consciousness is preserved. Sometimes tremor of the head or muscular twitching occurs at the onset, but these may be absent. The patient sinks limply to the ground with the eyes closed. The muscles are hypotonic, the pupils may fail to react to light, the tendon reflexes may be diminished or lost during the attacks, and the plantar reflexes may be extensor. Though completely unable to move or to utter a sound the patient is fully aware of all that is happening. Cataplectic attacks usually last less than a minute, and recovery is rapid. They are commonly precipitated by strong emotion, pleasurable or otherwise, especially by laughter, and the patient may be unable to move until he has controlled his feelings.

Sleep paralysis resembles cataplexy except that instead of being precipitated during the day by emotion, it usually occurs during the period of falling asleep or of awakening. The patient, though fully conscious, is unable to move hand or foot, and often feels intense anxiety. A touch will rapidly disperse the paralysis.

Somnambulism may be regarded as the reciprocal of cataplexy in that the patient, though partly asleep, is able to stand and walk in an automatic fashion. It is occasionally associated with narcolepsy.

Sleep Hallucinosis

Sufferers from narcolepsy sometimes experience vivid hallucinations. These, which are more often visual than auditory, may occur as the patient is falling asleep, when they are termed "hypnagogic hallucinations." Sometimes, however, they occur during the night when the patient is apparently awake. These hallucinations are often elaborate and terrifying, and, though they seem real at the time, their true character is readily recognized during waking life.

Thus a patient of mine, a married woman aged 34, who suffered from narcolepsy, would awaken every night in a state of terror in which external stimuli, such as the reflection of the street lamp on the wall or the wail of a cat, would appear to have a sinister meaning. She was also subject to terrifying nightmares. Another patient, an unmarried woman of 24 who also suffered from narcolepsy, had hallucinatory attacks which she described as nightmares and which preceded the narcolepsy by six months. As soon as she laid her head on the pillow she found that she could not move, but she would hear people whispering all round her head and "horrible laughter like that of the witches at pantomimes." She could feel ghosts coming into the bedroom and leaning over her, though she could not see them. Even more dramatic were the effects of these hallucinations on a man of 22, a commercial traveller, who had suffered from bad dreams since childhood. On three occasions his nocturnal hallucinations led to violent conduct on his part. All three of these attacks occurred when he was staying in a hotel in the course of his travels. He went to bed and to sleep at the usual time, but wakened about 2 a.m. to find himself standing by the bed. He experienced extreme anxiety, as if there was someone in the room creeping towards him and that it was imperative for him to get out. In this state he would shout, and, if no one came, give way to panic. Twice he broke a window, and on the third occasion he kicked a hole three feet wide between his own room and the next. As soon as someone came he became normal and retired to bed again. This man had always been subject to hypnagogic hallucinations when falling asleep in the twilight. In this state any object in the room would take on an alarming form as of something moving towards him. Similarly a noise would cause a sharp pang of fear and an acceleration of his heart rate.

Nature of Narcolepsy and Allied Disorders

We have now to explain narcolepsy and allied disorders in terms of a disturbance of sleep. Here I would emphasize that no hard-and-fast lines separate even the most bizarre of these disorders from the normal, least of all, perhaps, narcolepsy. The abnormal feature of narcolepsy is the sudden and irresistible onset of sleep, but it should be noted that the circumstances in which it occurs are often those which predispose to normal sleep, such as a monotonous occupation and a heavy meal. Narcolepsy is thus an exaggeration of a normal tendency. The narco-

leptic may perhaps be regarded as a person who has reverted to the polyphasic sleep of infancy. This may well be due, at least in part, to a deficiency of the control which the cerebral cortex normally exercises over the sleep centre, and in this connexion it may be significant that Kleitman and Camille (1932) found that though dogs are normally monophasic sleepers, decorticated dogs exhibited polyphasic sleep. It is also significant that drugs which cause increased cortical activity, such as benzedrine, cause wakefulness in normal people and diminish or abolish narcoleptic attacks in sufferers from narcolepsy.

Cataplexy has been ingeniously interpreted by Adie (1926) as a dissociation between the mental and the physical components of sleep. In a cataplectic attack the motor and postural centres fall asleep while the levels concerned with consciousness remain awake. It is certainly striking that in an attack of cataplexy all the motor and reflex changes typical of sleep appear. Even cataplexy, strange though it is, is not completely removed from normal life, as the term "helpless with laughter" indicates. The disorder of function in sleep paralysis is similar to that found in cataplexy, but of more gradual onset. Sleep does not, as normally, spread rapidly and diffusely through the nervous system, but the motor and postural centres fall asleep before the mind, or, in awakening, the mind awakens before the body. In either case the patient is conscious but powerless. In somnambulism the reverse occurs—the motor and postural centres are active while the mind is still asleep. In the words of Osler's beloved Sir Thomas Browne, "Those abstracted and ecstatick souls do walk about in their own corpses, as spirits with the bodies they assume, wherein they seem to hear, see and feel, though indeed the organs are destitute of sense and their natures of those faculties that should inform them."

Dreams and Hallucinations

During recent years dreams have received little attention except from psycho-analysts, who have been concerned to prove that "infected minds to their deaf pillows will discharge their secrets," although lately Dunne has attributed a metaphysical significance to dreams by regarding them as an extension of consciousness into a fourth dimension. Yet there is much to be learned from a study of the psycho-physiological aspect of dreams, as is illustrated by Havelock Ellis's book *The World of Dreams*. An investigation of dreams in the light of our new knowledge of the pathology of sleep, and in relation to organic lesions of the nervous system, such as intracranial tumours, would be especially fruitful. I can now only suggest the kind of questions that are awaiting an answer. Electroencephalography has shown that dreaming is associated with a burst of alpha rhythms in the second stage of sleep. At what level or levels of the nervous system does dreaming occur? What is the significance of the prominence in a dream of visual and to a less extent auditory imagery and the poverty of other sensory representations? The sense of smell is lost in dreams, as Sir Thomas Browne noted. "Nor will the sweetest delight of gardens afford much comfort in sleep; wherein the dulness of that sense shakes hands with delectable odours; and though in the bed of Cleopatra can hardly with any delight raise up the ghost of a rose." The same is true of the sense of pain, which is rarely experienced in dreams except those that are evoked by an actual bodily pain. Serious bodily catastrophes in dreams may be painless. In all these respects dreaming corresponds both with imagination and with memory. We can imagine and recall sights and sounds, but only with difficulty scents or pains. We imagine, remember, and dream mainly in terms of our exteroceptive, spatializing senses; and our dreams are projected into an external world.

There is another question which is fundamentally physiological but is of great importance for psychoanalysis. Why do I identify myself with some elements in my dreams and not with others? Thoughts and feelings, for example, are "me," but other people in my dreams are not "me": they appear to be outside me, and behave in a way that I cannot control or predict. This externalization is so complete that, as psychoanalysts are well aware, most people find it very difficult to realize that the characters in their dreams are parts of their own minds. Dr. Johnson once illustrated this by a dream of his own in which he felt mortified at being overcome by an opponent in a contest of wits. His comment was, "Had not my judgement failed me, I should have seen, that the wit of the supposed antagonist, by whose superiority I felt myself depressed, was as much furnished by me as that which I had been offering in my own character."

The explanation of this must be that in the dreams there is a splitting of consciousness in which the individual becomes divided into multiple personalities, but, just as in waking life there is only one "me" and all other persons and things are external, so in dreams only one personality is linked with the physiological basis of the self. The rest are externalized.

The sufferer from narcolepsy who experiences nocturnal hallucinations is of especial interest as being in a state intermediate between normal dreaming and a hallucinatory psychosis. In contrast to the normal dreamer the narcoleptic subject appears to be awake, and indeed is partially awake. In him the dissociation of sleep occurs at the highest nervous level while postural and motor centres and the sensorium are awake. Objects and events, therefore, are perceived, and incorporated in a waking dream in which, simultaneously, images of subjective origin are projected into the environment as hallucinations. It is significant that similar hallucinations have been described by Lhermitte (1932) as a result of lesions of the posterior hypothalamus. This "peduncular hallucinosis," as Lhermitte calls it, seems to be the direct outcome of a disorder of the sleep–waking centre.

At the level of the disorder of cerebral function there is no difference between a narcoleptic hallucinosis and a hallucinatory psychosis such as a toxic delirium or even schizophrenia. The narcoleptic state, however, is immediately reversible, and the victim can be awakened from his hallucinations. Perhaps convulsion therapy is only a crude method of awakening the schizophrenic. However that may be, it is clear that hallucinations are "such stuff as dreams are made of." The converse is equally true. We are all temporarily insane during sleep, and our waking moments are but lucid intervals.

REFERENCES

Adie, W. J. (1926). *Brain*, **49**, 257.
Bremer, F. (1937). *Bull. Acad. roy. Méd. Belgique*, **2**, 68.
Fulton, J. F. (1938). *Physiology of the Nervous System*, London, p. 259.
Kleitman, N. (1929). *Physiol. Rev.*, **9**, 624.
—— and Camille, N. (1932). *Amer. J. Physiol.*, **100**, 474.
Lhermitte, J. (1932). *Encéphale*, **27**, 422.
Pavlov, I. P. (1928). *Lectures on Conditioned Reflexes*, New York, p. 305.
Ranson, S. W. (1939). *Arch. Neurol. Psychiat.*, **41**, 1.
Szymanski, J. S. (1918a). *Pflügers Arch.*, **171**, 324.
—— (1918b). Ibid., **173**, 430.
—— (1919). *Z. allg. Physiol.*, **18**, 105.
Walter, W. G. (1938). *J. Neurol. Psychiat.*, n.s. **1**, 359.
—— Griffiths, G. M., and Nevin, S. (1939). *British Medical Journal*, **1**, 107.

TREATMENT OF EXPERIMENTAL TUBERCULOSIS WITH SULPHONAMIDE

BY

KONRAD BIRKHAUG, M.Sc., M.D.

(From the Chr. Michelsen Institute, Bergen, Norway)

Few bacterial or protozoal diseases have escaped experimental or clinical trial with one or more of the sulphonamide compounds since Domagk (1935) demonstrated their therapeutic value in haemolytic streptococcal infection in mice. Regarding the specific chemotherapy in tuberculosis, the statement of Wells, DeWitt, and Long (1923) is still valid that "no specific therapeutic agent has been found for tuberculosis. No chemical yet used has *cured* the disease in the experimental animals employed." It seems advisable, therefore, that the efficacy of the sulphonamide compounds should be tested in infection with the tubercle bacillus. Eight preliminary reports are already available of such investigations. The first of these was by Rich and Follis (1938), who found that the daily oral administration of 200 to 500 mg. of sulphanilamide to guinea-pigs subcutaneously inoculated with human tubercle bacilli "exerted a striking inhibitory effect upon the development of the tuberculosis." However, the drug failed to prevent completely the growth of the tubercle bacillus. Smithburn (1938) inoculated guinea-pigs intracerebrally with human tubercle bacilli and proceeded to treat them by intra-abdominal injections of 200 mg. of sulphanilamide for thirty days; no beneficial effects were noted. Buttle and Parish (1938) reported that "sulphanilamide appears to produce some degree of inhibition of an infection of guinea-pigs with a human strain of tubercle bacillus," while no such effects were noted in guinea-pigs and rabbits infected with bovine tubercle bacilli. Greey, Campbell, and Culley (1938) obtained the same beneficial effects against human tubercle bacilli provided the administration of the drug took place from the very beginning of the infection; when the treatment was delayed until seventeen to twenty-four days after inoculation the drug failed to alter the macroscopic appearance of the tuberculous lesions. Ballon and Guernon (1938) fully confirmed the work of Rich and Follis. Kolmer, Raiziss, and Rule (1938) made use of the intramuscular injection of 200 to 500 mg. of sulphanilamide per kilogramme twice daily for eight days after inoculation of guinea-pigs with human tubercle bacilli. They noted no curative effect of this interrupted therapeutic procedure. Further study of six derivatives of sulphonamide yielded negative results. Levin (1939) also treated a small group of guinea-pigs with 15 to 150 mg. of sulphonamide intramuscularly for eight days before and seven days after the subcutaneous inoculation with tubercle bacilli (type not stated). Necropsies performed eight weeks later failed to reveal any prophylactic or curative action.

Finally, Greey, Boddington, and Little (1939) repeated the earlier (1938) study of the senior author, and found that the daily oral dose of 300 mg. sulphanilamide, divided in four equal doses in twenty-four hours, inhibited the tuberculous process in guinea-pigs infected with human tubercle bacilli.

In short, all the reports of beneficial effects concern guinea-pigs infected with human tubercle bacilli and subsequently treated with sulphonamide during the entire post-inoculation period.

Technique

Statistical Assessment.—It is always highly desirable that the therapeutic trial of a new drug should be made on statistical evidence so far as possible. No such assessment was attempted in the aforementioned articles, except for a casual sentence in the report by Buttle and Parish that the statistical examination of "the size of the spleen did not provide any important evidence as to the intensity of infection." Our previous experience (Birkhaug, 1937, 1938, and 1939) with experimental tuberculosis in guinea-pigs has demonstrated that the effects which immunization or ascorbic acid administration exerts on the weight curve, leucocytic reaction, survival, and degree of tuberculous hyperplasia in the viscera and lymphatic glands are statistically assessable. Because of the importance of preventing immature and unjustifiable conclusions being drawn from experimental work regarding the use of sulphonamide in clinical tuberculosis, we decided that all *intra-vitam* and post-mortem data obtained from our tuberculous guinea-pigs treated parenterally with sulphonamide should be examined statistically.

As in our previous experience, we have made use of the special statistical method given by R. A. Fisher (1936) for comparison of two comparable means ($\bar{x}$ and $\bar{y}$), which involves the following calculations:

$$\bar{x} = \frac{1}{n_1 + 1} S(x), \quad \bar{y} = \frac{1}{n_2 + 1} S(y).$$

$$s^2 = \frac{1}{n_1 + n_2} \left\{ (Sx - \bar{x})^2 + S(y - \bar{y})^2 \right\}.$$

$$t = \frac{\bar{x} - \bar{y}}{s} \sqrt{\frac{(n_1 + 1)(n_2 + 1)}{n_1 + n_2 + 2}}, \quad n = n_1 + n_2.$$

When, as in our case, $n_1 + n_2 < 30$, the statistic P is derived by consulting Fisher's table of t. The value of P merely states the frequency with which a value of t greater than that observed could result from chance alone. A difference between two comparable means is considered significant when it is 2.5 times greater than its standard error ($t > 2.5$). The probability (P) that such a difference between $\bar{x}$ and $\bar{y}$ should occur from chance alone is thus one or less than one in a hundred ($P \leq 0.01$). However, the convention is to consider the difference between two comparable means significant when $P \leq 0.05$.

Preliminary Study of Toxicity of Sulphonamide.—Since no guinea-pig study of prolonged parenteral administration of sulphonamide was available, we were forced to proceed empirically. Six normal guinea-pigs weighing 451 sigma* 21.4 grammes, were daily injected intramuscularly with 0.5 c.cm. of a 2.5 per cent. solution of "prontosil soluble Bayer" (disodium-sulphonamide-benzolazo-acetylamine-oxy-naphthalene-disulphonate) for four weeks, 0.6 c.cm. for four weeks, and 1 c.cm. for six weeks. One c.cm. of prontosil soluble contains 25 mg. sulphonamide. This therapeutic procedure produced a loss of body weight from 451 to 328 grammes, increasing lassitude, and anorexia, as well as partial paralysis of the hind extremity. The blood picture showed hyper-leucocytosis (16,500 to 36,850), eosinophilia (8 to 13 per cent.), "shifting to the left" of neutrophils, and anaemia. One death occurred in four weeks, two in the tenth week, and three in the fourteenth week. These late deaths from toxaemia suggest a cumulative action of sulphonamide. The histopathological changes were dominantly fatty degeneration of the liver, splenic haemosiderosis, peripheral neuritis, hypo- or hyper-plastic bone-marrow, focal pneumonitis, slight testicular degeneration, and occasional doubly refractile concretions in the kidneys. It was apparent that smaller doses of prontosil soluble were essential in a guinea-pig study which required four to five months' daily parenteral injections with sulphonamide.

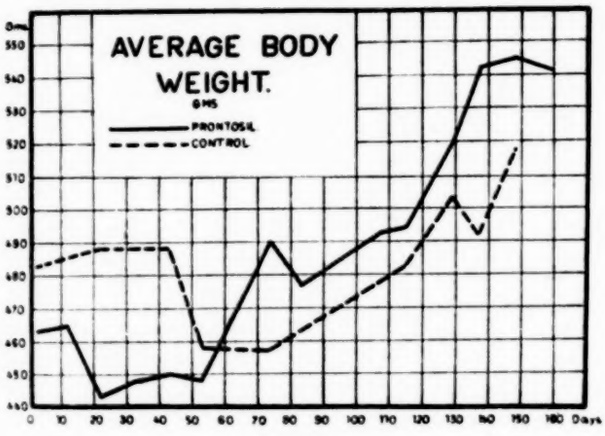
* Sigma (or "standard deviation") is the square root of the arithmetic mean of the squares of the deviations from the average. This measure of dispersion from the obtained mean gives more weight to extreme cases than other measures of variability—that is, quartile deviation, Q, mean deviation, A.D., or median deviation, or probable error.

Pre-infection Studies.—Forty-eight normal guinea-pigs were divided in two equal groups. The sulphonamide group (S.A.) weighed 463.2 sigma 47.37 grammes, and the control group (C) weighed 483.1 sigma 41.14 grammes. The difference between the mean weights was insignificant ($t = 0.277$; $P = 0.79$). The complete blood picture was done on six animals in each group on four occasions during two pre-inoculation weeks. No significant differences were obtained between the two groups. The tuberculin reaction with 10 mg. tuberculin was negative in all the forty-eight animals when a reading was made two days later. The S.A. group received daily one intramuscular injection of 0.2 c.cm. prontosil soluble for seven days before infection took place.

Infection of Guinea-pigs.—All the forty-eight animals were inoculated in the left leg with 0.00001 mg. virulent bovine tubercle bacilli (Laporte 815–3). This dose contained by culture approximately 718 viable bacilli. In our previous experience this dose had produced generalized tuberculosis and death in 158 sigma 31.8 days.

Treatment with Sulphonamide.—The twenty-four S.A. animals received the following intramuscular injections of prontosil soluble daily: 0.2 c.cm. for four weeks; 0.3 c.cm. for two weeks; 0.5 c.cm. for eight weeks; and 1 c.cm. for nine weeks. Thus each S.A. group animal received a total of 99.4 c.cm. prontosil soluble, or 2.485 mg. sulphonamide, during one pre-inoculation and twenty-one post-inoculation weeks.

Weight Curves.—Graph 1 shows that the weight curve of the S.A. group fell about 30 grammes during the first three weeks, remained stationary during the following five weeks,



GRAPH 1.

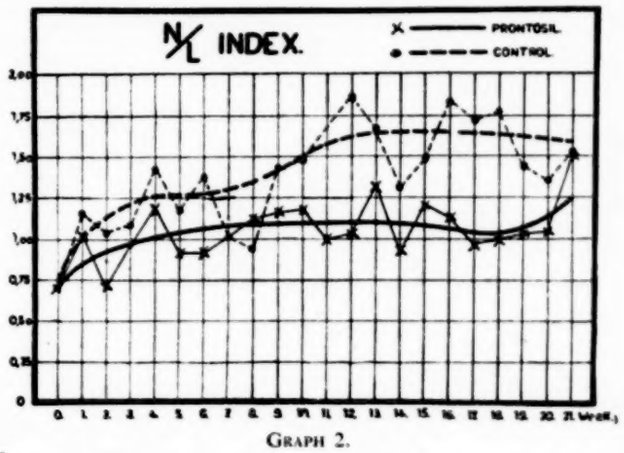
and thenceforth kept ahead of the control group weight curve by some 20 to 50 grammes during the remaining thirteen weeks.

Tuberculin Reactions.—Both the S.A. and control animals reacted equally with 10 mg. tuberculin when tested every month. At no time were the differences between the mean volumes of erythema and induration or the area of central necrosis sufficiently great to be of statistical significance.

Haematological Studies

It is generally admitted that the leucocytic reactions are of significance in the prognosis of experimental and clinical tuberculosis. Medlar (1926, 1929, 1935) has stated that four constantly varying components of the leucocytic reaction participate in the tuberculous lesions at different stages of the pathological process. The neutrophils predominate in the phase of abscess formation, of cavitation, and of ulceration; the lymphocytes are the chief cells in the healing of the tuberculous lesion, and the monocytes participate predominantly in the formation of monocyte (epithelioid) tubercles and in the early reparative process following caseation. Finally, the total leucocytic counts by themselves roughly indicate the volume of deranged tissue with which the leucocytes have to cope. The definitely unfavourable type of pathological process is therefore indicated when the neutrophils are above 65 per cent. and the lymphocytes are below 25 per cent. ($N/L = 2.6$). If to this unfavourable situation new tubercle formation is suggested by an increase in monocytes above 25 per cent. ($M/L = 1$), the process becomes still more unfavourable. We have attempted to follow such haematological changes in the S.A. treated and the control tuberculous animals.

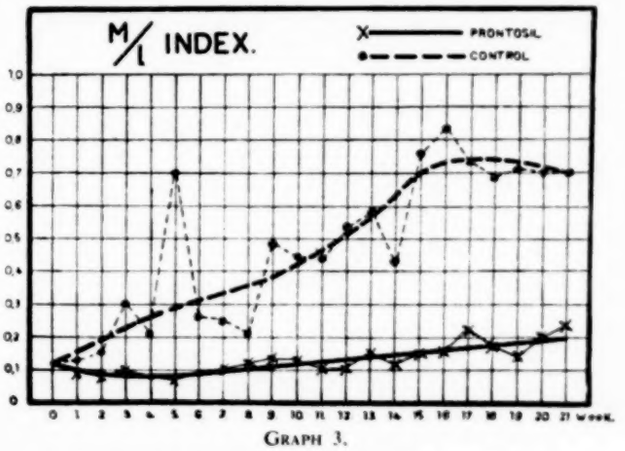
Neutrophil–Lymphocyte Index (N/L).—Graph 2 shows that the N/L index remains considerably more elevated in the control than in the S.A. treated animals. Suffice it to state



GRAPH 2.

that the difference between the mean N/L indices of the two groups is significant only on four occasions—namely, during the sixth, twelfth, seventeenth, and eighteenth weeks—but at no time is the difference of absolute significance—that is, $P \leq 0.01$.

Monocyte–Lymphocyte Index (M/L).—Graph 3 shows a steadily climbing M/L index in the control animals due to a gradual increase in monocytes from 5.6 to 21.8 per cent. and

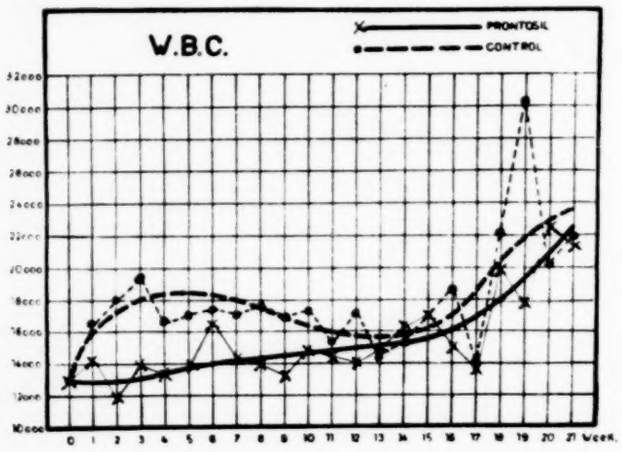


GRAPH 3.

a concomitant fall in lymphocytes from 44.3 to 30.9 per cent. in the course of twenty-one post-inoculation weeks. During this same period we note in the S.A. group an increase in monocytes from 5.5 to 10 per cent. and a fall in lymphocytes from 44.8 to 35.5 per cent. After the tenth week the difference between the M/L mean indices is continuously of absolute significance ($P<0.01$) in favour of the S.A. animals. This would suggest that the tubercle formation proceeds at a significantly retarded speed in the sulphonamide-treated animals.

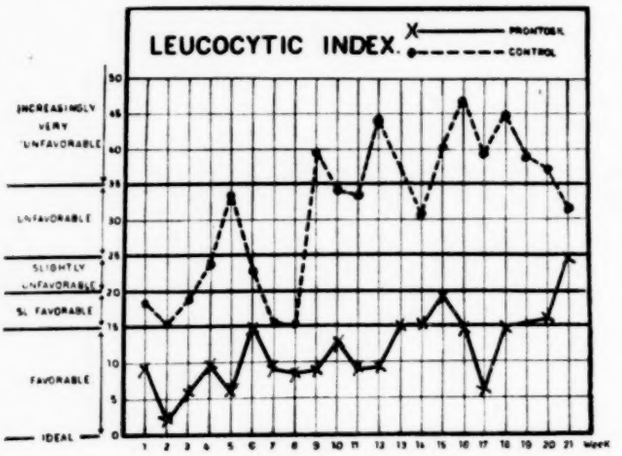
Leucocytosis.—Graph 4 shows that the mean leucocytosis in the S.A. animals is consistently lower than that in the control

group. Nevertheless, the one-direction increase is progressive in both groups. The difference between the mean leucocytosis values is statistically significant during nine of the twenty-one post-inoculation weeks and in favour of the S.A. group. In summing up the total mean values of leucocytosis for the entire post-infection period we note that the difference between the total means is of absolute significance ($t = 2.667$; $P<0.01$). This would suggest that the leucocytes in the sulphonamide-treated animals had significantly less deranged tuberculous tissue to deal with than the controls.



GRAPH 4.

Leucocytic Index.—By using Crawford's (1935) calculator to obtain the leucocytic indices as a short cut to correct interpretation of the leucocytic reaction in terms of favourable or unfavourable pathological activity, as evaluated by Medlar, we constructed Graph 5. The "leucocytic index" is derived from the N%/L% ratio + elevation of monocytes + value of abnormal total leucocytic cell count. Graph 5 shows that the leucocytic indices in the S.A. group veered between the favourable and slightly favourable zones until the twentieth post-infection week, when they approached the unfavourable zone. The leucocytic indices in the control group entered the unfavourable and very unfavourable zones after the eighth post-infection week. Thus in twelve out of twenty-one post-infection weeks the difference between the mean leucocytic indices is of absolute significance ($P<0.01$) in favour of the S.A. group. This fact must be considered as proof that the sulphonamide treatment exerts an inhibitory effect on the pathological activity stimulated by the virulent bovine tubercle bacilli. During the eighteenth to twenty-first week both the erythrocyte counts and haemoglobin percentage showed significant differences in favour of the S.A. group, but the average colour indices (0.921 sigma 0.066 in the S.A. and 0.960 sigma 0.081 in the control groups) lacked any significant deviations.



GRAPH 5.

Pathology

Survival Rate.—Three S.A. guinea-pigs died before the sixtieth post-inoculation day, partly from the toxic effects of the sulphonamide and partly from intercurrent respiratory infection. The tuberculous process in the left leg was confined to a localized caseous abscess and hard hyperplasia of adjacent inguinal glands. These animals are accordingly eliminated from the following examinations. The remaining twenty-one S.A. treated animals (87.5 per cent.) were killed between 159 and 162 days after the virulent inoculation. Among the control animals nine died of generalized tuberculosis between seventy-five and 142 days after inoculation. The remaining fifteen animals (62.5 per cent.) were killed between 153 and 157 days after inoculation.

Body Weight at Necropsy.—Before inoculation took place the S.A. group weighed 463.2 sigma 47.37 grammes, and the control group 483.1 sigma 41.14, which gives no significant difference ($t = 0.277$; $P = 0.79$). At necropsy, however, the S.A. group weighed 531.3 sigma 73.52 grammes, and the control group 435.5 sigma 66.52 grammes. The difference between these means is nearly nine times greater than its standard error ($t = 8.867$). Hence, $P<0.01$.

Gross Tuberculosis Scoring.—Using the scoring scheme given by Petroff and Steenken (1930) we found the following degrees of gross tuberculosis:

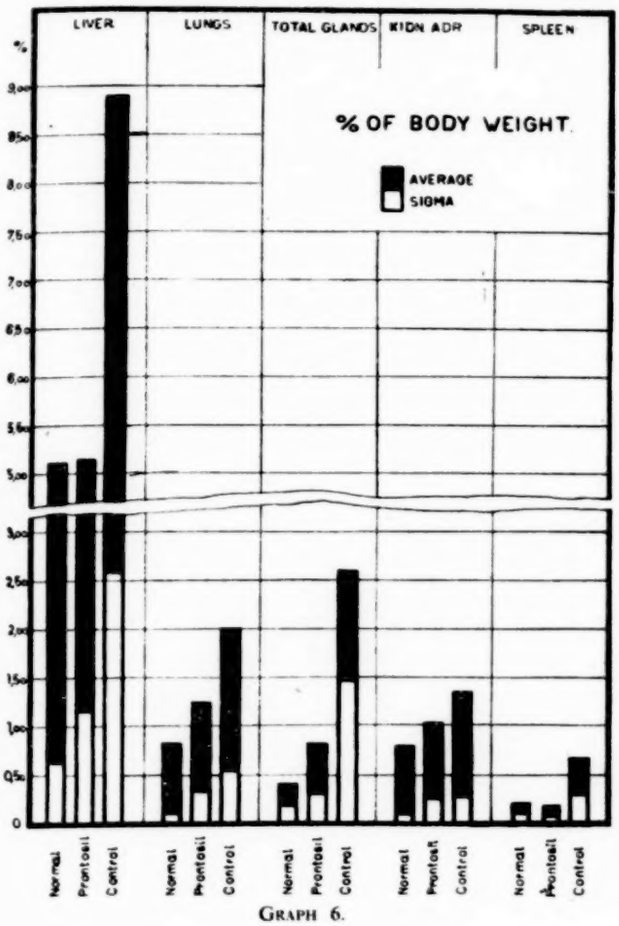
	S.A. Group	Controls
	%	%
(+)	61.9	16.0
(++)	28.6	16.0
(+++)	9.5	44.0
(++++)	0	24.0

Visceral Tuberculous Hyperplasia.—All necropsies were performed within a few hours after the death, when coagulation of the blood had taken place. A triple quantitative system was employed—namely, the determination of (*a*) the actual weight of the spleen, liver, kidneys-adrenals, lungs, and pooled lymphatic glands; (*b*) the actual volume (by water displacement) of the spleen, liver, lungs, and individual lymphatic glands; (*c*) the actual weights converted into percentage of the weight of the body from which the organs had been removed. These data are shown in Table I, and demonstrate that tuberculization had proceeded at a slower rate in the sulphonamide-treated animals. To make the comparison still more complete, we have included in that same table similar data from twelve normal guinea-pigs having the same weight as the control animals. Graph 6 depicts clearly the inhibitory effect of the sulphonamide therapy in the degree of visceral tuberculous hyperplasia.

Lymphatic Gland Tuberculous Hyperplasia.—The volumetric data on individual lymphatic glands are shown in Table II, together with data on the left subcutaneous abscess developing at the site of the virulent inoculation. All these data confirm the impression gathered from the leucocytic reaction that sulphonamide exerts a significant inhibitory action on the development of tuberculous tissue in the susceptible guinea-pig inoculated with small numbers of virulent tubercle bacilli of bovine origin.

Microscopical Examination.—Without exception, all the S.A. and control animals presented the classical epithelioid tubercles, with or without caseation. The predominant difference in the microscopical picture is the discreteness of the lesions in the S.A. group and their relative small numbers of acid-fast bacilli.

Bacteriological Findings.—By making use of strict aseptic post-mortem technique for the removal of exactly weighed portions of spleen, liver, and lungs, such material was homogenized, purified from adventitious bacteria, and seeded out on large tubes of Löwenstein's malachite-green, 0.75-per-cent.-glycerinated-egg medium, in various exact dilutions. After ten weeks' incubation at 37.5° C. the colonies of dysgonic bovine tubercle bacilli were counted. The results show that 0.25 mg. of spleen removed from six S.A. animals contained 28 sigma 11.3 colonies, and that the same weight removed from six control animals contained 164 sigma 43.1 colonies



GRAPH 6.

TABLE I.—*Quantitative Differences in Various Organs of 21 Sulphonamide (Prontosil Soluble) treated and 24 Control Tuberculous Guinea-pigs and 12 Normal Guinea-pigs*

(A) Actual Weight in Grammes

Organs	Normal		Sulphonamide		Control		t	P
	Average	Sigma	Average	Sigma	Average	Sigma		
Animal's weight	450	58.20	531	70.20	435	66.30	4.608	<0.01
Spleen ..	0.93	0.52	0.92	0.28	2.88	1.40	6.164	<0.01
Liver ..	23.10	5.42	26.80	5.42	37.90	8.94	4.872	<0.01
Lungs ..	3.64	0.34	6.46	1.35	8.57	1.73	4.662	<0.01
Kidneys-adrenals	3.58	0.43	5.37	0.84	5.81	0.83	1.759	0.08
Total glands	1.93	1.23	4.44	1.62	11.25	5.84	5.100	<0.01

(B) Actual Volume in c.cm.

Spleen ..	0.82	0.54	0.84	0.32	3.05	1.74	5.551	<0.01
Liver ..	20.20	3.63	24.10	5.04	36.90	8.84	5.798	<0.01
Lungs ..	4.94	1.83	8.93	2.45	9.25	2.15	0.423	0.68
Kidneys-adrenals	3.32	1.83	4.84	0.83	6.07	0.74	5.136	<0.01
Total glands	2.13	1.05	3.84	1.52	10.53	5.45	5.360	<0.01

(C) Weight as Percentage of Body Weight

Spleen ..	0.20	0.09	0.18	0.06	0.67	0.29	7.355	<0.01
Liver ..	5.12	0.61	5.15	1.15	8.91	2.59	6.021	<0.01
Lungs ..	0.82	0.09	1.24	0.32	2.00	0.54	5.543	<0.01
Kidneys-adrenals	0.80	0.08	1.03	0.24	1.35	0.26	4.196	<0.01
Total glands	0.41	0.17	0.82	0.29	2.61	1.47	5.364	<0.01

TABLE II.—*Volumetric Differences in Various Lymphatic Glands of 21 Sulphonamide (Prontosil Soluble) treated and 24 Tuberculous Guinea-pigs and 12 Normal Guinea-pigs. (Volume obtained by Water Displacement and expressed in c.cm.)*

Glands	Normal		Sulphonamide		Control			P
	Average	Sigma	Average	Sigma	Average	Sigma		
Lf. knee ..	71	46	662	557	989	823	1.510	0.14
Rt. „ ..	68	41	124	160	151	203	0.481	0.63
Lf. sup. inguinal	183	71	1007	428	4.196	3,745	3.794	<0.01
Rt. sup. inguinal	186	98	238	135	535	374	3.356	<0.01
Lf. deep inguinal	37	82	478	433	2.260	2.906	2.626	<0.01
Rt. deep inguinal	31	24	42	21	108	131	2.224	0.03
Lf. femoral	84	66	1.304	1,073	3,283	2,513	3.285	<0.01
Rt. „	71	59	344	480	1,672	1,592	3.598	<0.01
Periportal	278	119	888	610	3,258	2,190	4,692	<0.01
Lf. tracheo-bronchial	153	245	470	339	2,023	1,512	4.508	<0.01
Rt. tracheo-bronchial	138	294	336	259	1.518	1,130	4.586	<0.01
Lf. cervical	253	152	329	119	595	555	2.106	0.04
Rt. „	252	142	273	96	443	519	1.446	0.15
Lf. axilla ..	91	58	100	61	171	86	3.096	<0.01
Rt. „ ..	90	59	72	45	117	46	3.245	<0.01
Lf. subcut. abscess (site of inoculation)	—	—	453	578	2,160	2,111	3.499	<0.01

($t = 4.139$; $P<0.01$). The same weight of liver showed in the S.A. group 39 sigma 14.3 colonies, and in the control group 467 sigma 139.2 colonies ($t = 6.091$; $P<0.01$). Finally, 0.25 mg. of lung tissue from the S.A. group contained 193.2 sigma 84.3 colonies, and from the control group 2,974 sigma 1,937 colonies ($t = 11.361$; $P\leq0.01$).

Summary and Conclusions

The parenteral daily injection of sulphonamide, in the form of "prontosil soluble Bayer," seems to exert a significant inhibitory action upon the development of an infection of guinea-pigs with bovine tubercle bacilli.

The inhibitory action appears to be referable to the *in vivo* bacteriostatic effect of sulphonamide on the growth of the tubercle bacillus.

Inasmuch as sulphonamide only exerts an incomplete bacteriostatic effect on the tubercle bacillus, further investigations should be carried out with new compounds of sulphonamide. Such investigations are now in progress with M & B 693.

REFERENCES

Ballon, H. C., and Guernon, A. (1938). *J. thorac. Surg.*, **8**, 188.
Birkhaug, K. E. (1937). *Acta tuberc. scand.*, **11**, 199.
—— (1938). Ibid., **12**, 89.
—— (1939). Ibid., **13**, 45, 52, 163.
Buttle, G. A. H., and Parish, H. J. (1938). *British Medical Journal*, **2**, 776.
Crawford, A. M. (1935). *Amer. Rev. Tuberc.*, **31**, 611.
Domagk, G. (1935). *Dtsch. med. Wschr.*, **61**, 250.
Fisher, R. A. (1936). *Statistical Methods for Research Workers*, pp. 128–166, Oliver and Boyd, Edinburgh.
Greey, P. H., Boddington, G. D. M., and Little, M. H. (1939). *Proc. Soc. exp. Biol.*, N.Y., **40**, 418.
—— Campbell, H. H., and Culley, A. W. (1938). Ibid., **39**, 22.
Kolmer, J. A., Raiziss, G. W., and Rule, A. M. (1938). *Ibid.*, **39**, 581.
Levin, N. (1939). *Acta med. scand.*, **98**, 422.
Medlar, E. M. (1926). *Amer. J. Path.*, **2**, 275.
—— (1929). *Amer. Rev. Tuberc.*, **20**, 312.
—— (1935). Ibid., **31**, 621, 628, 642.
Petroff, S. A., and Steenken, W. (1930). *J. Immunol.*, **19**, 79.
Rich, A. R., and Follis, R. H. (1938). *Johns Hopk. Hosp. Bull.*, **62**, 77.
Smithburn, K. C. (1938). *Proc. Soc. exp. Biol.*, N.Y., **38**, 574.
Wells, H. G., DeWitt, L. M., and Long, E. R. (1923). *The Chemistry of Tuberculosis*, 2nd ed., Williams and Wilkins, Baltimore.

TYPHOID ENDOTOXOID VACCINE

A REVIEW OF THE RESULTS OF PREVENTIVE INOCULATION IN AN INOCULATED POPULATION OF 400,000

BY

E. GRASSET

Officer in Charge of the Serum Department, South African Institute for Medical Research, Johannesburg

In a communication presented four years ago at the eleventh South African Medical Congress I gave (Grasset, 1935) an account of the principles and methods in the use of typhoid endotoxoid (endo-anatoxin) as an immunizing agent against typho-paratyphoid infections, and of the preliminary results of this new form of antigen in the prophylaxis of typhoid fever on the Rand gold-mines of the Transvaal. Since then a number of publications, concerned chiefly with technical points and progressive steps in the perfection of the method, have appeared in various scientific journals. The present account, however, deals with the development and application of this new form of prophylaxis as actually applied to over 400,000 persons. It also records the results and statistics relating to the use of typhoid endotoxoid in the prevention of typhoid fever, and provides a comparison with those obtained by other methods of anti-typhoid immunization.

Nature and Principles of Endotoxoid Vaccine

The vaccine, prepared according to the method I elaborated (Grasset, 1933; Grasset and Gory, 1927), consists of *B. typhosus* endotoxin, extracted from concentrated heated bacterial emulsions (30,000,000,000 organisms per c.cm., equivalent to about 10 mg. of dry bacilli per c.cm.) by means of an alternate freezing and thawing process. The toxic soluble antigen, separated by centrifugation, is subsequently transformed, after the addition of an equal volume of saline, or preferably of Martin's broth, which enhances the detoxicating action of the formol (0.5 per cent.) at incubator temperature for six weeks. This results in an atoxic product which nevertheless retains its original immunizing properties. Finally it is diluted for use to an antigenic concentration corresponding to that extracted from 5,000,000,000 to 6,000,000,000 organisms of the original emulsion—that is, 1.5 to 1.8 mg. of dry bacilli—as the standard concentration, and up to 8,000,000,000—that is, 2.4 to 2.5 mg.—when the single inoculation method is contemplated.

As has been shown by Felix (Felix and Pitt, 1934a, 1934b, 1935; Felix and Bhatnagar, 1935), Topley *et al.* (1937), and Perry *et al.* (1933a, 1933b, 1934) in the case of suspension anti-typhoid vaccines, so experimental investigations have also convinced us of the importance of selecting Vi typhoid strains in the preparation of endotoxoid. When injected into the mouse, typhoid endotoxoid protects this animal against the intraperitoneal injection of several fatal doses of both virulent Vi and O strains of *B. typhosus* and of their endotoxin (Grasset and Lewin, 1937). These higher immunizing powers, coupled with the tolerance of both animals and man to large doses of the vaccine, afford the practical advantage that endotoxoid can be safely injected in considerably higher concentration than would be possible, without risks of undue reaction, with other forms of suspension or detoxicated typhoid vaccine. On the same principle, endotoxoids have been prepared from paratyphosus A, B, and C bacilli, capable of producing similar specific protection against the respective infective agent. By combining the different antigens a polyvalent typho-paratyphoid endotoxoid is obtained.

Nature of the Reaction

Preliminary applications carried out in 1933 on Europeans and natives, since confirmed by large-scale immunization, have shown that typhoid endotoxoid can be safely injected from infancy to old age. So far as children are concerned, observations on several thousand indicate that, apart from a certain hyperaemia at the point of inoculation, no appreciable reaction follows endotoxoid injection. The reactions observed in a small proportion of young subjects are of a mild and transitory nature, such as lassitude or slight malaise, accompanied on rare occasions by a rise in temperature of 0.5° to 1° F. during the day following the injection. The observations of de Villiers (1937), relating to systematic typhoid endotoxoid immunization in a closed European population of 5,499 persons (men, women, and children) on the Vaal-Hartz irrigation work, endorse our personal observations. Immunization consisted of two subcutaneous injections of 0.5 and 1 c.cm. of endotoxoid at eight days' interval for the adults, while in children proportional doses, varying from 0.1 to 0.8 c.cm., were used according to age. This system of dosage was employed throughout the whole series of immunizations recorded in this paper.

With regard to the temperature reaction following endotoxoid inoculation, Meyerstein (1938) has recorded his experiences on the same Vaal-Hartz works noted above in a group of 1,908 persons comprising men, women, and children—Europeans, natives, and Eurafricans. His findings are given in Table I below. The author states that so far as possible a record was obtained of any untoward generalized reaction towards the inoculation by the individual in the form of the persistence or not in over eighteen to twenty-four hours of any rise in temperature that might have been incurred due to the injection of the vaccine.

TABLE I

Temperature	First Inoculation			Second Inoculation		
	E %	EA %	N %	E %	EA %	N %
Normal ..	98.13	99.40	99.88	99.40	98.84	99.95
<99° F. ..	1.70	0.60	0.12	0.48	1.16	0.05
<100° F. ..	0.17	0	0	0.06	0	0
>100° F. ..	0	0	0	0.06	0	0

E=European. EA=Eurafrican. N=Native.

The above figures show that the temperature reaction following the endotoxoid inoculation is practically negligible.

Typhoid Endotoxoid Immunization on the Rand Gold-mines

The numerous data relating to the immunization of over 300,000 native workers on the gold-mines emphasize the high protection conferred by typhoid endotoxoid, and the exceptionally low incidence of reactions, varying from 0.3 to 1 per cent., an advantage which contributes to its easy acceptance, since there is no interruption of work. Analysis of the occasional reactions observed leads to the opinion that among the responsible factors the individual susceptibility plays a much more important part than the nature or concentration of the antigen.

Orenstein (1937), referring to the results of typhoid endotoxoid inoculation on the Rand mines, states: "There

are no cases on record among those inoculated with typhoid endotoxoid of any reaction which incapacitated the inoculated person in any way whatsoever for even a day." Van Blommestein (1936), in his paper on the control of typhoid fever by systematic immunization with endotoxoid on the Brakpan Mine, comes to the same conclusion. Referring to the efficacy of endotoxoid during the two years of observation, he concludes: "60,000 natives have been inoculated with this vaccine, and the incidence of enteric fever among those inoculated is one case of enteric and two of paratyphoid."

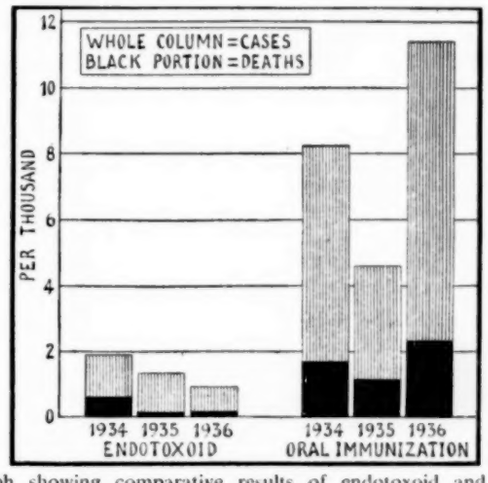
These results are particularly interesting if one considers the appreciable incidence of typhoid on this mine during the years preceding the use of endotoxoid, in spite of systematic T.A.B. immunization. The incidence was for the period 1932–4 an average of 5 per 1,000, with a mortality of 1 per 1,000, compared with 0.2 per 1,000 and no mortality for the two years 1935–6 since the use of typhoid endotoxoid. T.A.B. immunization had been carried out for some years on other Rand mine groups, but, according to Orenstein, the number of reactions was so high that mass protection with this vaccine was a practice difficult to carry out. It is for this reason that, prior to endotoxoid inoculation, oral immunization according to Besredka's method had been used on a large scale for some years. A preliminary comparative immunization with this last method and with endotoxoid, carried out on one of the Rand mines (E.R.P.M.) by Frew in the years 1934–5 on 14,000 natives and reported by Orenstein (1937), demonstrated both the much milder type of infection following the use of endotoxoid and the much lower mortality. Immunization by endotoxoid showed a mortality of 0.3 per 1,000, against 1.8 per 1,000 with oral immunization; and a case mortality of 4.48 per cent., as against 40.42 per cent. Unfortunately the full benefit of the endotoxoid immunization could not be deduced from these experiences, particularly in relation to the incidence rates, as in most of the doubtful typhoid cases final diagnosis was based on agglutination tests alone, which introduced the following fallacy. Further serological investigations showed, in about 90 per cent. of the endotoxoid-immunized persons, the presence of typhoid H and O agglutinin to high titre, with an average of 1/800 H and 1/220 O, and in many cases much higher—1/8,000 H and 1/5,000 O—these titres being considerably above those normally accepted as diagnostic of typhoid (Grasset and Lewin, 1936).

Following on these preliminary experiences a very rapid application of endotoxoid was witnessed. In the gold-mines, while 2,000 persons were immunized in 1933, 21,704 were inoculated in 1934, 45,849 in 1935, 84,837 in 1936, and over 160,000 in 1937, which represents approximately 50 per cent. of the permanent labour personnel. The total number of workers inoculated was 314,000, from thirty-six different mines. Thanks to the statistical department of the Transvaal Chamber of Mines, and to the co-operation of the mine medical officers, we were enabled to obtain general statistics for the whole of those employed in the Rand gold-mines for the period 1934–6, relating to the respective morbidity and mortality rates for the three following sections: (1) those immunized with endotoxoid; (2) those submitted to oral immunization; (3) non-immunized subjects. As will be seen from Table II, giving the comparative data relating to typhoid endotoxoid and oral immunization, a gradual fall in typhoid incidence from 1.8 to 0.89 per 1,000 occurred during the three years among the workers inoculated with endotoxoid, with a pronounced drop in the death rate, which was respectively 0.64, 0.11, and 0.19 per 1,000, compared with the considerably higher and irregular incidence and death rates among natives submitted to oral immunization.

TABLE II

Year	Typhoid Endotoxoid					Oral Immunization				
	No.	Cases	Dths.	Rates per 1,000		No.	Cases	Dths.	Rates per 1,000	
				Inc.	Dths.				Inc.	Dths.
1934	21,704	39	14	1.80	0.64	21,573	179	36	8.23	1.67
1935	45,849	59	5	1.29	0.11	26,403	122	30	4.62	1.14
1936	84,837	76	16	0.89	0.19	29,595	337	70	11.39	2.36
Total	152,390	174	35	1.14	0.23	77,571	638	136	8.24	1.75

General statistics on the total of 152,390 workers immunized with endotoxoid during these three years show 174 cases, twenty-nine of these after one inoculation, with thirty-five deaths; while among 77,571 subjects submitted to oral immunization during the same period there were 638 cases with 136 deaths. These comparative figures show that the morbidity and mortality rates were seven times lower in the endotoxoid-immunized than in the oral-immunized group.



Graph showing comparative results of endotoxoid and oral tablet immunization.

Finally, 2,231 cases of typhoid and 477 deaths were observed during the same period in 580,514 non-immunized workers, representing a mortality of 0.82 and a morbidity of 3.84 per 1,000, being respectively 3.5 and 3 times higher than among the endotoxoid-immunized subjects. These comparative figures are particularly interesting if one considers that most of these uninoculated workers belong to mines where inoculation was not introduced because epidemiological conditions were considered satisfactory. They reflect the influence of typhoid endotoxoid immunization on herd immunity.

In consequence of the rotation policy adopted with regard to workers on the mines, with an average period of contract of about twelve months, periodical introduction of carriers is inevitable. Sporadic cases or small epidemics are most likely to occur in spite of adequate hygienic measures unless systematic immunization of all new workers is carried out. The importance of such a policy being realized, the following resolution was passed by the members of the Transvaal Mine Medical Officers' Association (1937) at their general meeting in October, 1937: "That this association recommends the prophylactic inoculation against typhoid fever with endotoxoid vaccine

of all native labourers arriving on the mines, and that this inoculation be started immediately."

The effect of the wide application of inoculation, carried out on the thirty-six most important mines of a total of fifty-six, is already evidenced by the substantial drop in the general typhoid incidence and mortality on the whole of the Rand mines during 1937. Statistical figures of the Chamber of Mines relating to the whole of the workmen employed on the Rand mines during that year, and irrespective of the percentage inoculated, show, among 299,786 workers, a typhoid morbidity of 2.44 and a mortality of 0.54 per 1,000—that is, respectively, 28 per cent. and 30 per cent. lower than the corresponding figures for 1936. These are the lowest morbidity and mortality rates since 1929.

Application of Typhoid Endotoxoid Immunization by Other Public Health Organizations

Apart from the gold-mines and collieries, there has been a wide and increasing application of typhoid endotoxoid immunization, largely in place of other typhoid prophylactics previously in use, by public health organizations in both urban and rural areas—on several large irrigation schemes, in various towns and municipalities, in gaols, medical centres, native townships, and for hospital staffs, etc. The Union Department of Public Health has also advocated its use on the strength of a recommendation from the South African Council of Public Health. A typical example of the results of systematic endotoxoid immunization in a mixed population is that realized at the Vaal-Hartz irrigation scheme quoted above. As shown in the reports of de Villiers and Meyerstein—medical officers in charge of the works—not a single case of typhoid was reported in a population of 9,329, composed of workers and their families, inoculated from 1933 to 1937 with two doses of typhoid endotoxoid.

The information obtained from the various sources shows that wherever endotoxoid immunization has been introduced typhoid morbidity and mortality have dropped in impressive proportions. Evidence of these experiences soon resulted in endotoxoid being employed outside South Africa. Extended use has already been made in various British and foreign colonies. Investigations are now proceeding in several European countries especially affected by typhoid, such as Hungary and Russia. Recently, after my report to the sixth Conference of the International Association for Preventive Paediatrics, held at Rome in September, 1937, the recommendation of the use of typhoid endotoxoid as an immunizing agent against typhoid was incorporated among its conclusions (Grasset, 1937).

Endotoxoid Immunization among Children

Particularly interesting are the results obtained in campaigns carried out in several native townships in Johannesburg. In the Alexandra township of 20,000 persons, where typhoid had been particularly prevalent among children during the last few years (5.1 morbidity and 2.2 mortality per 1,000 in 1934), 4,351 natives, mostly children, were immunized by endotoxoid during 1935–7. Among the group of 3,208 immunized in 1935–6 only one case of typhoid fever, not fatal, was observed. During the same period 131 cases of typhoid were notified among the non-immunized population, the incidence rate being 3.4 per 1,000, compared with 0.31 among the inoculated persons—that is, ten times higher; the death rate of *nil* among inoculated subjects was a contrast to the 1.05 per 1,000 among the non-inoculated, representing forty deaths. Statistics relating particularly to children in 1936 show the presence of only one case among 2,052 inoculated (0.48 per 1,000), compared with forty-seven cases among 3,000 non-inoculated children (15.6 per 1,000)—a ratio about thirty-two times higher. Not a single case of typhoid was observed during 1937 among the 4,351 immunized persons. Inoculation consisted of two injections of endotoxoid at eight days' interval: 0.2 and 0.3 c.cm. for children of 1 to 5 years; 0.3 and 0.4 c.cm. for those of 5 to 10 years, and 0.4 and 0.8 c.cm. for those from 10 to 15 years; and 0.5 and 1 c.cm. for the adults.

Another example which may be quoted is that of the campaign carried out against typhoid at Sophiatown, a native township of some 10,000 persons, where typhoid endotoxoid immunization was introduced among school children in the year 1936. This leads to the consideration of a special aspect of the subject.

Combined Anti-typhoid-pneumonia Immunization

The susceptibility of the black races to pulmonary infections is well known. The work of Lister in South Africa has shown the importance of the types of pneumococci in the epidemiology of this infection and in the preparation of anti-pneumonia vaccine, used, on a large scale and with success, on the Transvaal gold-mines during the last twenty-two years (Lister, 1917; Lister and Ordman, 1935). The frequent occurrence of both pneumonia and typhoid in these native communities, and the difficulties experienced in carrying out multiple inoculations, have led us to devise a combined immunization by means of a mixed anti-typhoid-pneumonia vaccine, consisting of a suspension of 10,000,000,000 pneumococci per c.cm. in typhoid endotoxoid. Injected into mice this produced an anti-typhoid protection as strong as that from the endotoxoid alone. The simplification of technique resulting from this combined prodecdure has been followed by its rapid application among both children and adult native members of the population. Immunization consists of three inoculations at eight-day intervals, the third dose being necessitated by the pneumonia immunization.

For the sake of comparison, of a total of 1,357 children from the age of 2 to 17 years inoculated in the schools of Sophiatown, 824 were submitted to the combined immunization and 535 received typhoid endotoxoid alone. No cases of typhoid were observed in either of these two groups during the following sixteen months, including two typhoid seasons, while typhoid fever continued to occur among the non-immunized section of the population, including three cases in a neighbouring school, where no vaccination had been performed. Among adults, since the beginning of 1937, 48,000 native labourers on the gold-mines have been submitted to inoculation with this combined vaccine, with similarly good results and no considerable increase in reaction.

Anti-typhoid Immunization by Means of a Single Typhoid Endotoxoid Inoculation

Serological investigations having shown that a single injection of typhoid endotoxoid of high antigenic powers is sufficient to produce in man an agglutinin titre as high as 1/10,000 H and 1/5,000 O without undue reaction, a series of single inoculation immunizations was instituted among children and adults. On the Van Ryn Deep Mines 5,445 workers of a total of 6,652 were submitted to this single inoculation during the period September, 1936, to July, 1937. Only one non-fatal case of typhoid has been noted among these inoculated subjects during the year

following the introduction of the immunization, while eight cases with two deaths were recorded among the small proportion of non-inoculated workers (Grasset, Lewin, and van der Merwe, 1937).

With a view to the possibility of reinforcing the immunity so produced investigations were undertaken with an alum-precipitated endotoxoid prepared on lines similar to the principle elaborated by Glenny for diphtheria immunization. Such precipitated endotoxoid confers upon mice a protection against Vi *B. typhosus* at least as strong as that conferred by unmodified endotoxoid; in man, without causing undue reaction, it is followed by an agglutinin formation to titres such as 1/800 of H and 1/200 of O during the month following the inoculation.

Recent investigations on the nature of typhoid endotoxoid carried out in collaboration with H. D. Barnes—to be incorporated in a separate publication—have shown that by means of alcoholic precipitation a purified antigen is obtained. On being redissolved in saline the precipitated material confers on the mice and rabbits a degree of immunity and an agglutinin titre equal to that afforded by the untreated endotoxoid. These results are in agreement with those obtained by Topley, and Boivin in France, with the lipide-polysaccharide complex, isolated by various methods from the *B. typhosus*. Immunization of man has been undertaken with this purified endotoxoid, and this procedure also results in the formation of H and O agglutinins to considerable titre.

With regard to the duration of the immunity produced by endotoxoid, serological investigations show that a very appreciable H and O agglutinin titre is still present at the end of the first year in the blood of the persons inoculated. Epidemiological data indicate that there is present in the second year a degree of protection practically equivalent to that observed during the first year.

The introduction of typhoid endotoxoid is too recent for an actual limit of protection to be fixed. That information can only be accumulated over a period of years by epidemiological data and by a close study of the greatest possible number of subjects who have been immunized by this new form of vaccine.

REFERENCES

De Villiers, J. J. (1937). *S. Afr. med. J.*, **11**, 221.
Felix, A., and Bhatnagar, S. S. (1935). *Brit. J. exp. Path.*, **16**, 422.
—— and Pitt, R. M. (1934a). *J. Path. Bact.*, **38**, 409.
—— —— (1934b). *Lancet*, **2**, 186.
—— —— (1935). *J. Hyg.*, Camb., **35**, 428.
Grasset, E. (1933). *C. r. Soc. Biol.*, Paris, **113**, 20.
—— (1935). *S. Afr. med. J.*, **9**, 208.
—— (1937). *Int. Ass. prév. Pédiat.*, 6th Conference, Rome, 69.
—— and Gory, M. (1927). *C. r. Soc. Biol.*, Paris, **97**, 1211.
—— and Lewin, W. (1936). *Brit. J. exp. Path.*, **17**, 179.
—— —— (1937). *C. r. Soc. Biol.*, Paris, **124**, 331.
—— —— and van der Merwe, T. (1937). *S. Afr. med. J.*, **11**, 660.
Lister, F. S. (1917). *Publ. S. Afr. Inst. med. Res.*, **1** (No. 10), 303.
Lister, Sir Spencer, and Ordman, D. (1935). Ibid., **7** (No. 37), 1.
Meyerstein, R. (1938). *S. Afr. med. J.*, **12**, 324.
Orenstein, A. J. (1937). Ibid., **11**, 401.
Perry, H. M., Findlay, H. T., and Bensted, H. J. (1933a). *J. R.A.M.C.*, **60**, 241.
—— —— —— (1933b). Ibid., **61**, 81.
—— —— —— (1934). Ibid., **62**, 161.
Topley, W. W. C., *et al.* (1937). *Lancet*, **1**, 252.
Transvaal Mine Medical Officers' Association. Report of Meeting (1937). *Proc. Transv. Mine med. Off. Ass.*, **17**, 44.
Van Blommestein, J. H. G. (1936). Ibid., **16**, 9.

Dr. Nathan Bristol Van Etten, medical director of New York City's Morrisania Hospital, has been chosen president-elect of the American Medical Association, and will be inducted into office in June, 1940, when the Association meets in New York. At the recent annual meeting in St. Louis the attendance was 7,412.

SUDDEN BLINDNESS

BY

JOSEPH MINTON, F.R.C.S.

Ophthalmic Surgeon to Out-patients, Hampstead General Hospital; Ophthalmic Surgeon, Queen's Hospital for Children; Assistant Ophthalmic Surgeon, West End Hospital for Nervous Diseases; late Research Scholar, Royal Eye Hospital, London

Of sudden loss of sight of one or both eyes vascular lesions are the most common cause. Von Graefe reported the first cases of embolism of the central artery of the retina in 1859, and for many years this was accepted as the only possible cause of obstruction of the central retinal artery. The great advance in the study of ophthalmoscopic appearances of the retinal arteries and veins has enabled us to understand more fully the pathological changes which underlie the occlusion or obstruction of the retinal artery and the sudden loss of sight that ensues. George Coats in 1906, as a result of pathological research, came to the conclusion that obliterative endarteritis, with or without thrombosis, can produce a sudden obstruction of the central artery or of any of its branches, and that this form of obstruction is a much more likely event than embolism.

Spasm of the retinal arteries was first observed in 1874 by Raynaud in a patient suffering from the disease which now bears Raynaud's name. Since this date angiospasm of the retinal arteries with associated temporary blindness has been studied by many observers and proved to occur in lead and quinine poisoning, epilepsy, and migraine. In recent years Mylius has given an account of ophthalmoscopic observations in eclampsia and pre-eclampsia, in which conditions temporary visual disturbances due to spasmodic contractions of the retinal arteries are fairly common and may be one of the earliest diagnostic features. The observations of Mylius and Wagener, that the retinal arterioles may show both localized and generalized spasm in the toxaemia of pregnancy, suggest that these are probably general throughout the arteriolar system and are closely related to hypertension. The investigations of Wagener and Keith confirm Allbutt's original conception that hypertension is primarily due to spastic constriction of the peripheral arterioles, resulting in a dynamic increase of resistance.

Hypertension

The work of Dumas, Wagener, and Keith has led to the adoption of a subdivision of hypertension into three phases. Sudden blindness due to the occlusion of the retinal arterioles has been observed in all stages of hypertension.

THE FIRST PHASE

In the first or benign phase of hypertension the patients may be in good general health and have very few symptoms. The retinal arterioles are usually narrowed and may show irregularity of lumen as a result of tonic contraction with superadded localized spasm. The patients may complain of transitory blindness affecting one or both eyes, this blindness lasting a few minutes to a few hours. The sight is usually regained, but in many cases such attacks are followed by permanent blindness of the affected eye. These transitory attacks are due to a sudden spasmodic contraction of the retinal arterioles, which may subside quickly, having caused a temporary anaemia of the retina. Prolonged attacks lead to a post-spastic thrombosis of the affected vessel and permanent damage

of the retina. The ophthalmoscopic appearance of the fundus in the case of thrombosis of the central artery of the retina is the same as the one known to occur in embolism of the central retinal artery: a cherry-red spot at the macula surrounded by a whitish haze, pale disks, general pallor of the fundus, with threadlike retinal arteries. On many occasions one branch of the retinal artery only may be involved, and then one sees an occlusion of the affected branch and pallor of the surrounding retina. The superior temporal is the branch most frequently affected. In the case of occlusion of a branch of the retinal artery the patient may notice the loss of a portion of the field of vision in the affected eye, and on perimetric examination a sector-shaped defect will be discovered.

THE SECOND PHASE

In the second, more advanced, stage of hypertension the patient may have symptoms suggesting coronary, cerebral, or renal arteriosclerosis. The retinal arterioles show the well-known features of arteriosclerosis: crushing and kinking of veins at arteriovenous crossings, tortuous and narrowed arteries with irregular lumen, and occasional retinal haemorrhages and exudates. In this stage of hypertension sudden transitory or permanent blindness is most common. The sudden obstruction of the retinal artery or its branches is due to a localized thrombosis resulting from endarteritis obliterans and the spastic state of the diseased retinal arterioles. In this stage of hypertension, thrombosis of the central vein of the retina or its tributaries is also most common. In the latter condition the fundus presents the well-known picture of flame-shaped haemorrhages and exudates around the disk or, in the case of thrombosis of a tributary, the haemorrhages are confined to the part of the retina drained by the vein. In thrombosis of the central vein the patient becomes aware of a sudden loss of sight in the affected eye. Thrombosis of the tributaries of the central retinal vein is more common than that of the main trunk, and the loss of sight depends on the position of the tributary. In the case of thrombosis of the nasal tributaries the patient may not be aware of any loss of vision. On the other hand, thrombosis of the superior temporal or inferior temporal tributaries draining the central area of the retina leads to an appreciable loss of central vision, which the patient notices and for which he seeks advice.

THE THIRD PHASE

The third stage of hypertension was described by Wagener and Keith in 1928 and called by them the malignant hypertension syndrome. The patient usually complains of dyspnoea on exertion, asthenia, and visual disturbances. The fundi show, in addition to the above-described changes of the arteries and veins, multiple haemorrhages and exudates, oedema of the retina, and papilloedema. The arterioles reveal marked spasm and narrowing of the lumen resulting from advanced endarteritis obliterans. These fundal appearances are typical of severe angiospastic retinitis. Wagener and Keith followed up eighty-five patients who were diagnosed as suffering from malignant hypertension, and found that 78 per cent. of them had died within a year of the diagnosis. The vision of patients suffering from malignant hypertension is usually much affected as a result of haemorrhages and exudates of the central retinal areas. Attacks of transitory blindness are common in this group.

In 1937 I reported on my clinical study of fifty-four cases of occlusion of the central artery of the retina. In the course of this investigation I found that the condition occurred most frequently above the age of 40: of the fifty-four patients only five were under that age, and of these four had valvular disease of the heart. The majority of those examined showed evidence of arteriosclerosis of the non-affected eye and general hypertension. A number suffered only from temporary blindness, which had resulted from a temporary anaemia of the retina following an active spasm of the retinal arterioles, the sight returning on the disappearance of the arteriolar spasm. In the above-described group of fifty-four patients only three developed bilateral blindness as a result of bilateral occlusion of the central artery of the retina; in the other fifty-one cases the condition was unilateral. In the four young patients with valvular disease of the heart the sudden obstruction of the retinal artery was due to an embolus blocking the central retinal artery.

The other young patient, a woman aged 23, lost the sight of the right eye when getting out of bed on the tenth day after confinement with her second child. She was feeling quite well at the time. On examination no evidence of heart disease was found, and it might be assumed that a thrombus from the pelvic veins was carried to the right ventricle and through a patent foramen ovale to the left side of the heart and from there to the retinal artery.

Sudden loss of sight has been described after severe gastric or rectal haemorrhages, presumably due to a retinal anaemia. One of the patients in this series permanently lost the sight of the right eye on the day following a severe haematemesis. He did not seek advice until six weeks after the attack of blindness. Two patients lost the sight of one eye as a result of a spasm of the retinal arteries.

The first of these, a man aged 52 suffering from typical Raynaud's disease, suddenly lost the sight of both eyes. The left eye recovered its vision, but the right one became blind as a result of post-spastic thrombosis of the retinal artery. The other patient, who suffered from severe migraine, suddenly lost her sight while walking in the street. For a few minutes she could not see with either eye. After a short while she recovered the sight of the left eye, but the right eye became permanently blind.

Results of the Investigation

In this clinical investigation I found that thrombosis of the retinal vein or its tributaries is four times as common as occlusion of the retinal artery. The investigation was carried out at the Royal Eye Hospital, London, and during the period 1931–6, in the out-patient department there, 205 patients were diagnosed as suffering from thrombosis of the retinal vein or its tributaries, while during the same period only fifty-four were seen with occlusion of the retinal artery or its branches.

On reviewing the results of this clinical study one is driven to the conclusion that obstruction of the central retinal artery, which is so often described in textbooks as embolism of the central artery of the retina and said to be associated with valvular disease of the heart and infective endocarditis, is only rarely due to blockage by an embolus. In the vast majority of cases the obstruction is caused by a localized thrombosis in spastic and thickened arteries, occurring in patients suffering from hypertension. A number of these patients remained in good health for many years, with no evidence of disease of the coronary or cerebral arteries. In a follow-up of this group it was found that one-half of them were alive several years after the onset of the sudden blindness. One can therefore conclude that in hypertension the arteriolar sclerosis may follow a patchy and irregular distribution and that the involvement of the retinal arteries does not in all cases

indicate disease of cerebral or coronary vessels, which may or may not be affected later in the long course of the disease.

Treatment

Antispasmodic treatment should be administered to patients seen a short time after the onset of retinal artery obstruction. Among the measures used the following have been found the most successful: subconjunctival injections of acetylcholine, combined with hypodermic injections of the same drug; amyl nitrite inhalations and nitroglycerin tablets may also be useful. In addition, the eye should be massaged at frequent intervals to reduce intraocular pressure. In grave cases not responding to the above treatment, paracentesis of the eye is carried out with a view to reducing intraocular pressure, and thus allowing a dilatation of the retinal vessels. Reports of success following these measures—spasm of the artery subsiding and the vision returning—are often found in ophthalmic literature. The following recent case is instructive.

A man aged 54 suddenly noticed the loss of vision of the right eye when getting out of bed. He applied for treatment six hours later. He had had in the past several attacks of temporary blindness, which never lasted longer than five to ten minutes. On examination the following was found: Vision of the right eye was shadows only. Fundus: disk pale, constricted retinal arteries, and pallor of the retina. With the left eye vision was 6/9, and the fundus presented a typical picture of advanced retinal arteriosclerosis. The patient's blood pressure was 180/100.

Treatment.—Amyl nitrite inhalations were ordered, and the eye was massaged. This had no effect. A subconjunctival injection of acetylcholine (5 minims) was given; this was followed within half an hour by a gradual return of sight. The patient began to discern objects, and after three hours read 6/36. A second subconjunctival injection of acetylcholine (5 minims) was then given. On the following day the patient read 6/18, but had an inferior nasal sector-shaped defect of the field of vision, which became permanent. In this case the prolonged anaemia of the retina had caused partial damage to the central region and the superior temporal quadrant of the retina, supplied by the superior temporal branch of the retinal artery. The patient later received general treatment for arteriosclerosis.

Conclusions

Attacks of transient blindness should be regarded as a warning of vascular disease. In the diagnosis and prognosis of this disease the study and correct interpretation of the accompanying retinal changes are essential.

BIBLIOGRAPHY

Allbutt, T. C. (1896). *Trans. Hunterian Soc.*, 38–57.
Bonamour, G. (1936). *Étude clinique du fond d'œil dans l'hypertension artérielle*, Cohendet Frères, Lyons.
Coats, G. (1906). *Roy. London ophthal. Hosp. Rep.*, **16**, 262.
Dumas, A. (1931). *Presse méd.*, **39**, 129.
Friedenwald, H. (1930). *Trans. ophthal. Soc. U.K.*, **50**, 452.
von Graefe (1859). *Arch. f. Ophthal.*, **5**, Abt. 1, 136.
Gunn, R. M. (1892). *Trans. ophthal. Soc. U.K.*, **12**, 124.
Keith, N. M., Wagener, H. P., and Kernohan, J. W. (1928). *Arch. intern. Med.*, **41**, 141.
Minton, J. (1937). *Proc. roy. Soc. Med.*, **30**, 285.
Moore, R. Foster (1916). *Trans. ophthal. Soc. U.K.*, **36**, 319.
—— (1924). *Retinal Venous Thrombosis*, London.
Mylius, K. (1928). *Ophthal. Gesellsch.*, Heidelberg, **47**, 379.
Orr, H. C., and Young, J. H. (1935). *British Medical Journal*, **1**, 1119.
Redslob, E. (1926). *Ann Oculist.*, Paris, **163**, 169.
Wagener, H. P., and Gipner, J. F. (1927). *Amer. J. Ophthal.*, **10**, 650.
—— and Keith, N. M. (1937). "Diffuse Arteriolar Disease and Hypertension," 15th Int. Ophthal. Congress, 1937.

NEUROSES AMONG COMBATANT TROOPS IN THE GREAT WAR*

BY

FREDERICK DILLON, M.D.

Medical Superintendent, Northumberland House Mental Hospital; Chief Assistant in the Department of Psychological Medicine, University College Hospital

Recent events would make it appear that we may be called upon to use the experience obtained during the great war. It seems advisable, therefore, to refresh our knowledge of the disorders associated with warfare and of the methods of dealing with them. A series of six lectures on the war neuroses has recently been delivered at the Tavistock Clinic, and the following account, which has not before been published, of experience in the treatment of these conditions in France from 1916 onwards may, I hope, prove also to be helpful.

Functional Nervous Disorders

The functional nervous disorders comprised a considerable proportion of the total casualties. From the statistics given in the *Official Medical History of the Great War*,[1] which are admittedly incomplete, it is not possible to obtain an accurate idea of the comparative wastage from this source. But an estimate was made shortly after the war had ended that one-third of the unwounded and one-seventh of those discharged from the British Army were permanently unfit on account of functional neuroses and mental disorders. For the first two years of the war all cases of this kind were evacuated to England and treated there. This was partly due to the erroneous opinion, widely accepted at that time, that these conditions, to which the misleading name "shell-shock" had been applied, were largely or wholly brought about by damage to the nervous system as the result of shell explosions and similar agents. It was commonly held that a shell exploding near an individual must inevitably produce injury to the nervous system, from the liberation of the tremendous forces of compression and decompression. Cases were described of death following an explosion in which no external marks were visible on the body but in which punctate haemorrhages and evidences of violence to the nervous system were found on post-mortem examination. It was only gradually realized that these were exceptional cases and that every day, in and near the trenches, men were blown up and buried who showed no sign of any injury to the nervous system and who were able to continue on duty without being sent to hospital. There was, further, the increasing evidence that conditions precisely similar to "shell-shock" occurred in men who had never been subject to the action of an explosive. Results of treatment in England had proved very disappointing; the tendency to fixation of the symptoms and the development of an attitude of chronicity had been only too apparent, and a great many of these men had been discharged from the Army and pensioned.

It was in the attempt to stem the loss from this source that the advanced centres in France were established towards the end of 1916. The experiment had previously been tried in the French Army and had met with encouraging success. I was appointed "shell-shock" specialist to the 3rd Army in December, 1916, and sent from an infantry regiment to a stationary hospital on the lines of communication. There I found three or four cases with functional nervous symptoms in an ordinary medical ward. There was no clinical room in the hut which formed the ward, and no place where the patients could be examined

* The facts on which this article is based are taken from a thesis presented for the M.D. at Edinburgh University. Permission has been obtained for publication.

[1] *Official History of the Great War: Medical Services*, 1931, Final Volume, p. 116.

and interrogated in private. I applied for and obtained, after some time, a hut, built for about thirty beds, with two clinical rooms and two cubicles in which treatment by seclusion could be carried out. Later, another hut of similar size was obtained, and as the number of patients increased they had to be accommodated in tents beside the huts. Owing to the changing vicissitudes in the military situation the centre was moved on four occasions to different hospitals. The numbers of patients fluctuated according to the intensity of the fighting, and on at least one occasion there were over 500 patients in the centre, with two medical officers to deal with them.

In twenty-two months, to October, 1918, 4,235 cases, apart from officers, were treated at the centre. The problem was essentially a practical one—to evolve a method of dealing in a rapid and effective way with men whose adaptation to active war conditions had broken down, and to restore the adaptation. The emphasis was on treatment and results, and not on research into the mental pathology of the cases. From previous experience I had already come to the conclusion that psychologically the central factor in the loss of adaptation was connected with the fear mechanism of the mind, and this was borne out by the further insight obtained in the study of cases at the centre and by the results of treatment. I do not think it is helpful under conditions of this kind to attempt to stress the distinction between fear, anxiety, apprehension, and similar terms. The current conflict could best be explained in words which the soldier was familiar with, such as "wind-up," "funk," or "fear," and the most important psychotherapeutic step was that he should understand the nature of it. No doubt it is true that internal as well as external factors played a part, and that on deeper analysis further sources of anxiety could have been elicited. But the current conflict, dependent on the special environment, was obviously the important one, and all practical indications showed that it was the one to which the main attention should be given.

Types of Case

Experience led me to classify the cases into five types:

1. A direct anxiety or fear state characterized by generalized shaking, nervousness, "jumpiness," and sometimes dizziness and headache.

2. A type in which mental confusion or stuporous phenomena formed the central feature. These conditions were generally of short duration, and I looked upon them as more intense and severe instances of the first type.

3. Cases in which conversion symptoms, such as mutism and paralysis, were the most important elements. These were similar to the hysterical manifestations met with in civilians.

4. Conditions in which amnesia or a fugue state constituted the main phenomenon.

5. Combined types of cases in which a war neurosis developed in conjunction with an organic disorder or with a previous neurosis.

By far the largest group was that which displayed direct fear or anxiety symptoms (Type 1): this comprised 70 per cent. of the total. Next came the cases with conversion symptoms (Type 3), which made up 20 per cent. of the total. The other three classes accounted for the remaining 10 per cent. It is not suggested that an absolute or fundamental difference existed between these categories. They shaded into one another, and were separated mainly for practical convenience. True obsessional states were rare, and comparatively few psychotic cases were received at the centre. As Dr. G. W. B. James[1] has pointed out, there is no evidence that the strain of war increased the incidence of insanity among the troops.

Type 1 Cases

The war neuroses could actually be observed in their development, and the following account gives a typical instance of the circumstances in which they occurred. On December 5, 1916, a raid was attempted by about 80 men of the battalion to which I was medical officer, and took place in a sector of the line occupied by another regiment. After the party had gone over the top the sky cleared and the light from the moon gave the situation away. The men were accordingly ordered back into the trench, which, being held by other troops, was now crowded. The enemy thereupon began a bombardment by trench mortars, one of which fell and exploded directly in a bay filled with troops. An officer and four men were killed, three men were wounded, and eleven men reported to me shortly afterwards with "shell-shock," having in the interval been ordered into a dug-out. I saw them in the support trench by the light of the moon; all of them were considerably "shaken up," nervy, jumpy, and tremulous, and one man was suffering from aphonia. As the raiding party were due for forty-eight hours' rest, none of these patients were sent to hospital. It was intended to see them the following morning; but this was rendered impracticable by the battalion being moved again into the front line, and it was two or three days before the cases were seen individually. By that time two of them had reported sick to a field ambulance and had been sent to hospital. The following is a brief account of four typical cases.

A private aged 26 stated that he was in the bay in which the minnenwerfer exploded. It made him so shaky and tremulous that he could not keep still. He was set to digging the buried men out, but he became so sick that he had to be sent back. He stated that he thought it was fright that made him sick. There was no amnesia. Particulars regarding him were: service in the Army, ten months; with the battalion, five months; occupation before the war, labourer. He stated that he had had slight sunstroke about three years before. His family history was negative as regards nervous or mental disease. He reported at the interview that he was much better, but got somewhat shaky and sick at times. He was, however, quite able to continue with his company.

A private aged 29 stated that he was moving along the trench when the trench mortar exploded. He saw the flash and, in addition to being rendered shaky and nervous, he became blind for a little while. About ten minutes later, when ordered to the dug-out, he found that he could not speak above a whisper. There was no amnesia. He had served in the Army about fifteen months and with the battalion for four months. His occupation before the war was that of a gardener. There was no previous history of nervous or mental disease, and the family history was negative. When seen his shakiness had passed off, and the aphonia, though present to a slight extent, was better and was improving. He was able to carry on quite well with his company.

Private J., aged 25, stated that he was in the adjoining bay when the trench mortar exploded. He saw the flash and heard the noise of the explosion, and was blown against the trench. After that he remembered no more until he "came to" and found himself in the dug-out. Possibly an hour had elapsed, and he was feeling shaky and somewhat faint. The completion of the history of this case from the evidence of another soldier is of very considerable interest. This soldier stated that he was with Private J. in the dug-out. J. went "straight off" and lay stiff for about five or ten minutes. A stretcher-bearer came and gave him water; then the patient began to mumble, and shortly afterwards began struggling and shouting, "Kill all men with white faces to-night" (the faces of the raiding party were blackened). He gave the impression that he saw Germans running away, for he kept struggling and shouting, "Bomb them, bomb them! Don't let them get away!" He also attempted to strangle a man next to him. As his pockets were full of bombs he had to be held down. For all this the patient had a complete amnesia. His service in the Army was nine months, and with the battalion seven months. He was an engineer before the war. There was no personal history of previous nervous or mental disease, but two uncles had committed suicide; one of them, an alcoholic, had hanged himself, the other died after cutting his throat during an attack of depression. At the interview J. reported that he was well except that he felt somewhat faint occasionally. He was "carrying on" in the usual way with his company.

The next case is similar to the last described. A private aged 33 stated that he was in the bay in which the trench

[1] Report of lecture at the Tavistock Clinic, *British Medical Journal*, 1939, 1, 234.

mortar exploded. He was thrown down and buried, and remembers someone pulling him out. After that he had no further recollection until he came to himself about half an hour afterwards, in the dug-out, shaking all over so that he could not keep still. Another soldier stated that he was on the steps of the dug-out with the patient. The latter seemed to be very excited and not to know what he was saying. He kept shouting that he wanted to get at the Germans and throw bombs at them. He was struggling so much that he had to be held down, but gradually became quieter. Of this delirium the patient himself had no recollection. He had served in the Army for seven months, and had been with the battalion two and a half months. His occupation before the war was as a labourer. There was a history of a previous nervous breakdown four years earlier, after an accident in which he was nearly run over by an engine on the railway. His mother had had two paralytic strokes, a brother had St. Vitus's dance, and an aunt had "nervous debility." When seen the patient stated that he still felt somewhat shaky when shells went off, and somewhat weak. He was, however, carrying out his ordinary duties in his company. There was no sign of organic derangement of the nervous system in any of the cases.

The remaining five cases were similar to the first one described.

Several interesting points are brought out from a consideration of these nine cases. The first, and most striking, is the fact that the men were all able to return to duty after about forty-eight hours' rest, a fact especially impressive in the case of the two with delirium. None of them asked or expected to be sent to hospital. Secondly, none of these men had any special form of treatment. All of them showed general tremulousness, nervousness, and "jumpiness" varying in degree. This was the commonest form of "shell-shock," the symptoms of which, in my view, constitute the basic features of all the forms of the war neuroses. It was found that when the symptoms of the other types had cleared up—when, for example, confusion, or stupor, or conversion phenomena had disappeared, or an amnesia had been resolved—the residual state was always of this form (Type 1). The condition occurred with every degree of severity, from those who showed mainly "loss of nerve" and slight external symptoms and those with marked generalized shaking, excitability, dryness of the mouth and throat, excessive perspiration, and occasionally incontinence of urine, to a semi-convulsive form in which phases of delirium and stupor sometimes developed, as in two of the instances mentioned.

Comments on the Other Types

Descriptions of further cases of Type 1, although of great interest, would take up too much space, and brief comments on the other types are all that can be given. When confusion was the main feature and lasted beyond the period of initial mental shock the condition was more serious. It cleared up as a rule, however, after a few days, under general treatment, although the symptoms of the residual state were apt to be more persistent.

Cases with conversion symptoms formed a varied group, but clinically the manifestations were similar to those found in civil life. They differed in the ease with which they could be cured when dealt with promptly. Treatment by the faradic brush or seclusion seldom failed to restore the disordered function to normal, and the condition then became similar to those characteristic of Type 1. This class, with conversion phenomena, formed a considerable proportion of the chronic category in England, and the rule at the centre was that no patient was evacuated to the base with a symptom of this kind. If we except a number of cases of stammer, which does not respond to the same treatment, the rule was consistently carried out.

Instances of the next type, that with complete amnesia and fugues, formed a small but important group. Localized amnesia was a frequent symptom in the war neuroses, but cases in which complete or general loss of memory and somnambulism occurred were comparatively rare. They were conditions not uncommonly simulated by the malingerer, and, apart from this, from the circumstances of military life they were of much graver import than the other types. A man who wandered away from his unit committed a crime against military law. Consequently the unfortunate victim of a fugue often found himself under arrest, or even under the extreme sentence of a court-martial. It was of the utmost importance, therefore, to endeavour to obtain a clear and adequate insight into the patient's state of mind. This was often no easy matter, as the available evidence frequently consisted, for the most part, of the statements of the patients themselves. My experience was that in cases of complete or systematized amnesia of an extensive nature the memory began spontaneously to return at the end of four or five weeks.

The fifth class, of combined neuroses, need only briefly be referred to. They formed a small group in which a war neurosis developed upon a pre-existing disorder, either physical or mental. Thus cases were seen in which a neurosis arose in conjunction with conditions of pituitary disease, disseminated sclerosis, early general paralysis, and others. On the other hand, the opportunity occurred of analysing patients in whom the features of a neurosis which had arisen in civil life developed after the occurrence of a war neurosis and greatly complicated the clinical picture. It has to be borne in mind that there were certain forms of neuroses which never passed through the centre. These were the more slowly developing cases expressing themselves in obscure disorders of different systems, such as the gastro-intestinal, the D.A.H.s, and N.Y.D.s. From our cursory methods of recruiting it happened not infrequently that many individuals with neurotic, to say nothing of mental, symptoms found their way into the Army. Indeed, it was remarkable what numbers of men of this type volunteered. It was inevitable that most of these would prove incapable of adapting themselves to the strain of active warfare. From time to time, consequently, even complicated cases of chronic neurosis of many years' duration were admitted into the centre with the superaddition of a war neurosis, after vainly struggling to adjust themselves to the war environment. It is an interesting fact, however, that not all of these individuals broke down. Many adapted themselves quite effectively to active war conditions, and only broke down after the war was over.

Differential Diagnosis

In regard to differential diagnosis the chief conditions to be distinguished were concussion, pathological fatigue states, and malingering. Concussion occurred with surprising infrequency. At any rate, if it supervened after such traumata as being blown up or buried, it did so in the majority of cases in a slight form, which passed off so quickly as to be in practice negligible. It might have been expected to show itself in the cases seen after the raid, but there was no discernible evidence of it; and, certainly so far as the cases admitted to the centre are concerned, in only very few were indications of concussion evident. *A priori* considerations of the alleged inevitable effects of a bursting shell within a certain radius were found in practice not to be accurate. Most men who served in the trenches for any length of time, and certainly most men who went "over the top" in the later stages of the war, when the practice of the barrage had reached its height, came necessarily into close proximity to exploding shells. Very few of them, however, developed concussion.

Fatigue was present in most cases, but was generally of the physical type, which cleared up after a few days' rest in bed. Instances of true neurasthenia in which fatigue was the central and important feature of the condition occurred mainly in men employed in the administrative branches of the Army, who were subject to prolonged periods of intensive routine work; but sometimes it occurred in those who had had too long a spell of active service and too little leave.

Malingering was the most important condition to distinguish from the war neuroses, and in a busy centre one had constantly to be on the alert. Conversion symptoms were not common as forms of simulation and, in any case, were unimportant from the ease with which they could be cured. The most frequent—and most natural—manifestation was an exaggeration and prolongation of the symptoms, and a tendency to the development of a hypochondriacal attitude. This was combated not only by the brief psychotherapeutic talks but by the psychological atmosphere of the centre. Among other things arranged for the convalescent cases a concert party, recruited from among the patients, was maintained, and it was interesting to note the humour and tolerance with which satire on the subject of "shell-shock" was received. From time to time, however, creations of a more elaborate nature were seen which required careful investigation and caused no small difficulty in diagnosis. Records of these cases may be published later.

Results of Treatment

The results of treatment were surprisingly good, and proved the value of the advanced centres in dealing with these conditions. Of the total number of 4,235 cases treated, 63.5 per cent. were made fit to return to duty—that is, mainly to fighting units. The direct tremulous type, and the more definitely hysterical type with conversion symptoms, were by far the most hopeful. The acute tremulous apprehensive symptoms of Type 1 subsided generally in the course of three or four days in the atmosphere of the hospital. The conversion symptoms—mutism, aphonia, deafness, and the others—were so easily and rapidly amenable to treatment as to be practically an indifferent factor in the estimation of the case. Once the conversion symptom was cured the case became similar to those of Type 1. In regard to relapses, there were 5 per cent. of readmissions from this cause, but it was impossible to form an accurate estimate owing to the movement of troops from one army area to another, and unfortunately there was no linking up of the different centres. The average period of residence in hospital for the cases successfully treated was eighteen days. Treatment was directed in the first place to ensuring rest and sleep. Every patient admitted to hospital was kept in bed for three or four days, seldom longer. This was sufficient to do away with the physical fatigue. Sleeplessness was not common, but if for any reason, such as marked tremulousness or apprehension, a patient was unable to sleep he was given paraldehyde, 3 drachms. This was practically the only sedative used, with the exception of hyoscine, occasionally given for violent "crises," and was almost invariably effective. During this period treatment of conversion symptoms was carried out. There were simple methods available for dealing with these conditions, such as persuasion and exhortation and also hypnosis, which were generally successful. But as, in treating large numbers of patients, saving of time and energy was essential, seclusion or faradism was commonly employed. These procedures were carried out with due regard to the patient's feelings and, as I have already mentioned, seldom failed.

In general, the sooner the cases were dealt with the better the outlook, and the patients were received at the centre within, as a rule, twenty-four to forty-eight hours after becoming casualties. The evidence of the earlier years of the war was that, if neglected, these conditions rapidly became complicated and a process of demoralization set in, which led in most instances to discharge from the Army and a pension. At the centre every effort was made to keep a stringent control over demoralizing influences, and to help to key the patient up to the adaptation standard, which meant developing a degree of stability which enabled him to return to the environment that had caused his breakdown. This did not imply the abolition of conflict in his mind, for that was impossible, but the building up of a state of controlled adjustment to active war conditions which, in itself, at basis, was actually a state of conflict. "To be feared of a thing and yet to do it is what makes the prettiest kind of a man," as Stevenson put into the mouth of Alan Breck Stewart, and this formed an epitome of the psychotherapeutic aim. The condition being due essentially to a current conflict, no prolonged or elaborate analysis was necessary. In fact, for obvious reasons, such measures of treatment were contraindicated in the great majority of cases. The essential fact was that the patient should be made aware of the nature of the neurosis—of the breakdown of the fear-controlling mechanism. In the severer cases and when, after the patient had been invalided to England, the condition had become more or less chronic, different measures of treatment were necessary, and all the resources of psychotherapy had to be called into effect. Those who had experience in dealing with pensioners discharged with "shell-shock" after the war were made aware of the difficulties in treatment that existed.

The endeavour to estimate predisposition as an aid to prognosis was far from an easy problem. Cases commonly occurred with a clear personal and family record and yet with which no return to active war conditions was possible. On the other hand, many men with histories indicating predisposition recovered rapidly and returned to their units after a period of treatment. In this regard the history of the nine cases from the raid may be recalled. Four of the men had a definite family or personal history of nervous disorder; two of these, in addition, had had an apparently severe though brief attack of delirium. Yet all returned voluntarily to the trenches after only about forty-eight hours' rest. A captain in a famous regiment who, after two years' distinguished service in the field, found himself in hospital with a typical attack of war neurosis of Type 1, stated that from childhood he had always been timid. Noises, he said, especially affected him, so that when in the line he always wore ear protectors. Until a few years before, if he were at a railway station when an express train passed through, he stated that he became so nervous that he had to clench his teeth and shut his eyes. Yet in the course of over two years' hard fighting on the Western Front this officer obtained the D.S.O. and the M.C. In several instances that have come under my observation decorations for bravery have been won after the occurrence of an attack of "shell-shock." I am unable to discover how the incidence of the war neuroses in the British Army compared with that in the carefully chosen American Expeditionary Force, but it appears that the 3,647 cases of "shell-shock" which occurred in the U.S. Army during the great war corresponded to a ratio of 0.98 per thousand admissions to hospital.[1]

In the light of increased knowledge and experience I do not think that the forms of neuroses likely to occur in the next war will be different from those met with in the last. Fear-inspiring conditions will be similar but more intense. They will act on human beings with the same instincts, the same kinds of defence mechanisms, and similar neurotic proclivities. It was an impressive fact in the great war to note the extent to which the ordinary man was capable of adapting himself to active war conditions. This power of adaptation will probably be put to a greater test in the next war, and if it is realized in official circles that there is a breaking-point for every individual, arrangements may be made to give more frequent relief from the continued strain that such adjustment implies. The fact that civilians will be involved will make the whole question a much larger and more complex one. States of panic may occur at first, before the general population has been able to adapt itself to the new circumstances in which life will have to be lived, and we can only hope that those in authority are taking adequate steps to deal in advance with what is likely to prove a problem of considerable magnitude.

[1] *Med. Dept. of the U.S. Army in the World War*, 1925, **15**, pt. 2, 577.

Clinical Memoranda

Complete Intravitam Haemolysis following Abortion

The following case seems worthy of being placed on record on account of its rarity.

CASE RECORD

A married woman aged 25, who had had three normal confinements, admitted to her private medical attendant that at the tenth week of her fourth pregnancy she had taken cochia pills (aloes and colocynth) to procure an abortion, but douching or other local interference she denied. Bleeding began in the early hours of October 13, 1938, and during the morning she complained of vomiting, diarrhoea, and severe abdominal pain. At 2 p.m. a neighbour who was helping with the household duties noticed that her skin was turning a dark purple. Her private medical attendant was called, but soon after his arrival the patient lapsed into coma. He immediately arranged her transfer to the Leeds Maternity Hospital, where on arrival the appearance she presented was remarkable. The whole of her skin, conjunctivae, and mucous membranes, with the exception of the buttocks, were stained an intensely deep maroon. The discoloration did not disappear on pressure, and was due to haemolytic staining. She was a small slim woman, quite unconscious and pulseless, her temperature was 104.4°, and her respiratory rate 60. Microscopical examination of a sample of blood showed complete haemolysis of all the red cells; only their ghosts remained. She was incontinent, and catheterization obtained only 1/2 oz. of black urine. Death took place one hour after admission.

Post-mortem Examination.—During the interval which elapsed between death and necropsy gross post-mortem swelling had occurred. The face and neck were black and swollen, and the tongue was protruding. There was considerable distension of the abdomen with gas, and in all the subcutaneous tissues crepitus could be felt. The abdomen contained much gas and haemolysed bloody fluid, and all organs showed an extreme degree of haemolytic staining. The stomach and its contents were removed intact and sent for chemical analysis, which was reported later to be negative. The size of the uterus was larger than it should have been for a ten-weeks pregnancy; there had been a recent abortion, only blood clot and membranes remaining, but there were no gangrene or signs of trauma. The liver showed the same staining as did all the other organs; it was soft, necrotic, and full of gas bubbles, and looked like a sorbo sponge. The spleen was semi-solid or normal size, and black in colour. The kidneys were soft and black, and the anatomy of the medullary cortical systems could not be made out. The tongue and oesophagus showed no signs of burning by irritant fluids. The lungs were oedematous and contained bubbles of gas, and in the pleural cavity was 2 oz. of blood-stained fluid. The heart was normal. As in similar cases which have been reported, poisoning by a chemical agency such as potassium chlorate or one of the coal-tar derivatives was suspected, but the analyst's report for the contents of the stomach, blood, and urine was negative. Histological examination showed the whole body to be teeming with gas-gangrene organisms, which on culture were found to be *Clostridium welchii*.

I should like to express my thanks to Mr. A. M. Claye, honorary obstetric surgeon to the Leeds Maternity Hospital, for permission to record this case.

W. H. TOD, M.D., B.Sc., M.R.C.O.G.,
Formerly Resident Surgical Officer,
Leeds Maternity Hospital.

BIBLIOGRAPHY

Dawbarn, R. Y., and Williams, B. (1938). *British Medical Journal*, 2, 279.
Hill, Arthur M. (1936). *J. Obstet. Gynaec. Brit. Emp.*, **43**, 201.

Reviews

PRESENT-DAY KNOWLEDGE OF VIRUSES

Handbuch der Virusforschung. Erste Haelfte. Edited by Prof. Dr. R. Doerr and Prof. Dr. C. Hallauer. (Pp. 547; illustrated. RM. 66; bound R.M. 69.) Vienna: Julius Springer. 1938.

In this work, edited by Doerr and Hallauer, the present state of knowledge of viruses is treated in a comprehensive manner and in its relation to general biological problems rather than in its purely medical aspect. Virus infections are not treated individually, but facts concerning specific viruses are frequently quoted to illustrate the points under discussion. This volume, which represents the first half of the complete work, is subdivided into four sections dealing with the development of virus research and its problems, the morphology of viruses, their cultivation outside the animal body, and their biochemical and biophysical properties.

In the first section the senior editor traces the development of our knowledge and discusses the various hypotheses put forward from time to time as to the nature of viruses. The problem of the nature of viruses and their biological significance is considered in the light of recent work. The heavy proteins of plant viruses and the saprophytic viruses are discussed, and the question of the endogenous origin of viruses within the tissues of the host is treated at some length. In this, as in the following sections, the views put forward are necessarily the expression of the author's personal evaluation of the available evidence. It is doubtful, however, whether the arguments in relation to the endogenous origin of the virus of herpes febrilis will be generally accepted, and in the critical review of the work purporting to illustrate the intracellular multiplication of viruses no mention is made of the important investigations of Bedson and Bland on the intracellular development of psittacosis virus.

In Section II, which deals with the morphology of viruses, a clear account of the methods for determining the size of virus particles by ultrafiltration, ultra-violet light photography, and centrifugal analysis is given by Elford, and the results obtained by these three methods are set forth in detail and compared. The method of fluorescence microscopy as applied to the study of virus morphology is described by Haitinger, while Kaiser deals with the staining methods used for the demonstration of virus elementary bodies, with helpful comments on the results obtained by their use. The various types of inclusion bodies and their relation to viruses are discussed by Findlay, but in this article technical methods for the demonstration of inclusions are not given in detail. Section III is devoted to the cultivation of viruses. In the first part Hallauer discusses the various methods of growing viruses in tissue culture and the results obtained by this method of investigation; in the second part the technique and application of the method of culture on the chorio-allantoic membrane of developing hens' eggs are described by Burnet.

In Section IV, on the biochemistry and biophysics of viruses, Stanley deals at length with plant viruses, a field in which his own work has been outstanding. Concentration and purification have been more readily achieved with plant viruses than with animal viruses; consequently much work of fundamental importance has been done on the physical and chemical properties of the heavy virus proteins of plants. At present, however, it is doubtful whether the author is justified in assuming that the results

obtained with plant viruses are applicable to many of the animal viruses. The studies of Beard and Wyckoff on Shope papilloma virus, for instance, hardly seem to justify the view that this virus is a heavy protein similar in nature to tobacco mosaic virus protein. In this section also the "transformation agent of the pneumococcus" is described because of its virus-like properties, but it seems quite unnecessary to postulate the existence of a virus-like agent to explain the phenomena observed in relation to the transformation of pneumococcal types.

This book, written by acknowledged experts in their particular subjects, should prove extremely valuable to workers interested in virus research in relation to medicine or in its wider application to fundamental biological problems. A clear account of the aspects of the subject treated is given, specific methods recently developed for the study of the properties of viruses are fully described, and to each section extensive bibliographies are appended.

FRACTURES AND DISLOCATIONS

A Manual of Fractures and Dislocations. By Barbara Bartlett Stimson, M.D., Med.Sc.D., F.A.C.S. (Pp. 214; 95 figures. 12s. 6d. net.) London: Henry Kimpton. 1939.

Fractures and Dislocations in General Practice. By John Hosford, M.S., F.R.C.S. General Practice Series. (Pp. 274; 71 illustrations. 12s. 6d. net.) London: H. K. Lewis. 1939.

The treatment of fractures has undergone a remarkable change in the last few years. On the one hand, it has been realized that they are of great practical importance, and not only that they are serious for the individual but that they involve a heavy economic loss to the State. On the other hand, it is at last realized that by modern methods of treatment the loss on both counts can be greatly reduced, that function can be restored in a much shorter period than was formerly required, and that the active co-operation of the individual is essential to the best results. Such changes of outlook are reflected in the two volumes under review, and though entirely different in their method of presentation they are both inspired by the same modern spirit of enterprise.

Dr. Barbara Stimson has made excellent use of the vast material at her disposal in the Presbyterian Hospital of New York City, and she has brought to her subject an originality of outlook and a sense of humour which are very unusual. To state that a fracture is an injury, that it occurs in an individual, that it involves a portion of the body, and that finally it is a break in a bone, are fairly obvious propositions, but in the author's hands they serve as texts for lessons which every student and many surgeons might well take to heart. All the important facts the student should know of fractures and their treatment are expressed with the same simplicity, while he is enabled to visualize every detail by outline sketches which are entirely admirable. To cover the whole subject so thoroughly in 200 short pages is a considerable achievement, but to have made all the details so interesting and so obvious shows the hand of the artist.

Mr. Hosford's book is of a very different type but equally practical. It is intended particularly for the student and the young practitioner, but a surgeon of some experience in these matters must confess that he has read it with great interest and not a little advantage. Beginning with the general principles of treatment, it gives a description of the methods to be employed and does not omit those minute details of plaster technique on which success depends. The various complications of fractures are discussed, and the author then proceeds to a detailed discussion of fractures and dislocations as they occur in various regions. The book is well illustrated throughout by *x*-ray photographs, so well produced that they show changes in the structure of the bone which are of great importance but are not always recognized. We cannot quite agree that "there are four epiphyses at the lower end of the humerus," nor can we agree with the pathological anatomy which is based on this assumption. But this is a small matter, and perhaps would not be noticed were it not for the general accuracy of the work. Mr. Hosford's book should be of real assistance to the student, and, indeed, to everyone who is engaged in handling fractures. A pleasant feature is the brief description with which the volume concludes of five great leaders in the treatment of fractures.

DEVELOPMENT OF THE HUMAN CORTEX

The Postnatal Development of the Human Cerebral Cortex. Volume I. The Cortex of the Newborn. By J. Le Roy Conel. (Pp. 114; 98 plates, including 194 figures. 2 tables. 35s. net; 8 dollars.) London: Oxford University Press; Cambridge, Mass.: Harvard University Press. 1939.

This book represents a concerted piece of research work having for its object the demonstration of those changes which take place in the neurons as development in the behaviour of the growing child progresses. The first volume, by J. Le Roy Conel, contains a description of the microscopical appearances of sections of the cortex of the human brain at birth; these have been taken from various regions, on both sides of the brain, and prepared by different methods in order to show special structural elements of the nervous tissue. Ninety-one large plates all show side by side three photomicrographs of sections prepared in three different ways—namely, (1) paraffin preparations stained with cresyl-violet; (2) the Cajal silver impregnation method; and (3) the Golgi-Cox mercuric chloride method. The fourth figure in each plate is a camera-lucida drawing, by Miss E. Piotti, of isolated neurons, showing the characteristic forms of the cell body, axon, and dendrites. The first four plates are full-size photographs of the full-term human brain at birth, which show the brain as a whole and in section, whereas the three succeeding plates contrast reproductions of the cerebral localization charts of Campbell, Brodmann, and Economo.

Some of the more important conclusions which have been noted in the first section of this work may be outlined briefly. (1) The definitive structure of the human cerebral cortex is already established at birth and is strikingly similar in all parts of the general or "isocortex," which shows the typical six horizontal laminae, with large pyramidal cells in Layer 5. (2) Variations from the six-layered pattern of the isocortex are found in the marginal zones and in some parts of the rhinencephalon—"allocortex"—although even here some points of resemblance to the six-layered isocortex are found. (3) The cells of the stratum granulosum in the gyrus dentatus are probably homologues of the large pyramidal cells of other parts. (4) No mitotic figures have been seen anywhere in the cortex. (5) No Nissl bodies were found in any cells of the cortex, though "there is a suggestion of agglutination of the cytoplasm in some of the largest giant cells of Betz," and numerous cells with well-developed Nissl bodies are present throughout the entire length of the brain stem and spinal cord. (6) No neurofibrils are demonstrated by the Cajal silver method in the cortex, except in some of the largest Betz cells; also no neurofibrils are present in any cells of the upper half of the brain stem, but some are present in the largest cells of

the lower half. All the cells in the anterior column and in Clark's column of the grey substance of the spinal cord are completely filled with neurofibrils which extend into the axons and dendrites. (7) The area precentralis giganto pyramidalis (FA_γ) has progressed in differentiation beyond any other part of the cortex, and more especially that part of this area which determines movements of the upper part of the trunk and the muscles acting on the scapula and humerus.

This volume is a valuable contribution to the morphology of the central nervous system, and the publication of succeeding sections of the work will be anticipated with much interest.

RUDIMENTS OF BIOCHEMISTRY

Biochemistry for Medical Students. By William Veale Thorpe, M.A., Ph.D. (Pp. 457; 37 figures. 12s. 6d.) London: J. and A. Churchill. 1938.

This book has been written "to supply the student of medicine or dentistry with those biochemical facts that he will especially require." It goes far beyond his minimal requirements for examination purposes, providing that extra amount of material which the keen and intelligent student, who clearly recognizes the increasing importance of biochemistry, will really wish to acquire. The volume is constituted upon a well-thought-out plan, the rationale of which is explained at the beginning, and in which physico-chemical principles occupy a basic position. It is practically impossible to devise a scheme into which all the different sections of the subject will fall naturally into place, but the author's arrangement is, from a teaching point of view, as good as could be designed. While the very clear, concise presentation of the essential facts is alone enough to ensure its success, its merit as a book for students does not rest on that only. Certain sections are dealt with particularly well. Of these we select for mention the unfolding of the mysteries of the stereochemistry of the sterols, the diagrammatic scheme showing the relations of the sex hormones (though here many might find it difficult to follow the author in his statement that it explains the occurrence of oestrone in male and female urine), and the full data on nutrition compiled from authoritative sources such as Orr's book on *Food, Health, and Income*. It is of special interest, too, to see included the references to heavy water, and the explanation of the use of heavy hydrogen (deuterium) to label hydrogen atoms in compounds, and so trace out metabolic paths. One further point must be mentioned, for it would be doing less than justice to both author and publishers to omit reference to the excellence of the photographs, diagrams, and lay-outs of formulae. Clearly the book represents exceedingly good value for its very modest price.

BROMPTON HOSPITAL REPORTS

Brompton Hospital Reports. A Collection of Papers recently published from the Hospital. Volume VII, 1938. (Pp. 207; illustrated. 5s.) London: The Hospital for Consumption, Brompton. 1939.

There is little to comment on in the papers included in this volume—all, except two, already published elsewhere. They consist mostly of addresses before medical societies, and their range is wide, as can be seen from a few titles: "The Differential Diagnosis of Haemoptysis"; "How Long should Collapse Therapy be Delayed?"; Obstructions of the Trachea"; "Radiology and the Surgery of Inflammatory Lesions of the Lungs"; "Cardiac Emergencies." Included also are two papers by Drs. Lee Lander and Davidson on the pathogenesis of bronchiectasis. The views these authors express will need confirmation before they are widely accepted. Of the two articles not hitherto published, Dr. W. D. W. Brooks, in one, writes on induced selective collapse in pneumothorax therapy as carried out with the special bag he has devised. The account he gives of the ten cases in which the method was applied does not appear to justify its use except in occasional cases, particularly as the remote effects of the procedure are as yet unknown; indeed, the views of Lee Lander and Davidson suggest that the method would result in bronchiectasis. In the other article Mr. R. C. Brock reports on his experience of thoracoscopy and cauterization of adhesions based on 442 operations. Although this series of adhesion-sections is by no means the largest one performed, the paper is a valuable addition to the literature on the subject. And it is of interest that Mr. Brock comes to the same conclusion as Gullbring and other authors who have carried out a large number of these operations, that every adhesion which overlies an area of diseased lung should be divided if possible, even if cough and sputum are absent.

With regard to the statistical reports note may be made again of the paucity of cultural examinations and the absence of examinations of the gastric contents for tubercle bacilli.

Notes on Books

Professor RICHARD CABOT'S well-known *Physical Diagnosis* has now reached a twelfth edition with Dr. F. DENNETTE ADAMS'S name on the title page as joint author. It is published in this country by Baillière, Tindall and Cox, price 22s. 6d. The preface explains that the evaluation and presentation of the new material for this edition reflect, but are not restricted to, the personal views of the authors. They have drawn also on the experience of many of their colleagues at the Massachusetts General Hospital, and the work in its present form represents, so far as possible, a cross-section of the views on diagnosis held by the staff of that institution. The general purpose of the book remains the same: "To show how we think the patient should be examined, to describe and interpret important symptoms and signs, and briefly to discuss the more common disorders in which they occur."

In spite of the highly eulogistic foreword by the late Pol. N. Coryllos, the present reviewer cannot say a great deal in favour of the very lavishly produced slim volume of 150 pages entitled *Pulmonary Tuberculosis—a Synopsis*, by JACOB SEGAL (Oxford University Press, 10s. 6d.). This is not because the author does not show obvious extensive clinical experience and discrimination, but perhaps simply because the subject of pulmonary tuberculosis does not readily lend itself to synopsis form, and in such a form is not likely to be adequately understood by the very people for whom a synopsis is usually intended. And, in justice to Dr. Segal, he himself in introducing the book is very modest in his claims for it.

Professor HANS SCHULTEN'S *Lehrbuch der Klinischen Haematologie* (Leipzig: Georg Thieme, RM. 37; bound, RM. 39) must be regarded rather as a system of haematology of the calibre of Otto Naegeli's classical work than as a handbook, and will appeal more to the advanced student and little to the practising clinician. It is unfortunately in more senses than one a heavy book—it weighs in its paper binding 2½ lb., and is written, like so many German textbooks, in a tedious long-winded style which makes difficult reading not relieved by the dazzling shine of the paper used by the printer. The great labour Professor Schulten has devoted to the selection and analysis of the

vast literature of the subject calls for congratulations and thanks, but it is a pity his bibliography and references are often so meagre and wanting. The sections concerned with " pernicious anaemia " and " familial jaundice " stand out for special praise, though generally we believe haematologists will accept this book as the leading authority on the subject. In the reviewer's copy there is an unfortunate error in the binding whereby pages 66 to 79 occur for a second time after page 257. The publishers are to be congratulated for the excellence of the coloured illustrations.

In *Des Variations Immunitaires aux Infections Tuberculiniques en Fonction du Terrain* the author, MICHEL GROENEN, whose qualifications, appointments, or country of origin are nowhere given in the book (and one assumes that he is a medical practitioner in France or Belgium), brings forward the view that thymic disturbances are largely responsible for the development of tuberculous disease. Thymus administration is therefore the treatment *par excellence*. The booklet of sixty-five pages is written in what sounds at times like pseudo-scientific language, and is illustrated by reproductions of skiagrams that appear to prove nothing at all. This publication of J. B. Baillière et Fils, priced at 20 francs, cannot be taken seriously.

In his Sao Paulo thesis entitled *Contribuiçao para o Estudo das Nevralgias do Trigêmio* Dr. CARLOS GAMA RODRIGUES gives a detailed account of trigeminal neuralgia, with brief histories of 123 cases in patients aged from 19 to 84, of whom fifty-eight were men and sixty-five women. To those not familiar with Portuguese the illustrations and bibliography of 146 references will be useful.

Preparations and Appliances

AN INSTRUMENT TRAY

Mr. A. SIMPSON-SMITH, M.Ch., F.R.C.S., writes:

Orderly operative technique is extremely difficult to establish, and it is not eased by the constant flux of students and nurse assistants in every hospital or nursing home. Time and sometimes tranquillity are lost in trying to find a tool hidden under a pile of disorderly instruments. Helström in Sweden, and Ogilvie in London, have attempted to meet the difficulty by devising instrument-racks upon which assistants can arrange and replace each tool before and after use. Ogilvie's excellent apparatus, however, requires time in affixing the supporting table, assembling the tray, and suspending the tools.

The present instrument tray consists of three drawers which lie side by side when open, " nest " inside each other when closed (Fig. 1), and in both positions are interchangeable and reversible. In laying out the tray a rod is slipped through central holes in the sides of the large drawer (Fig. 2), and the two smaller drawers are drawn on to the rod, a screw being affixed to the other end. Opposing studs and sockets in the sides of the drawers ensure a very rigid table. The tray has the following advantages:

1. It is reasonably light, portable, and readily assembled.

2. The loaded tray is placed on the patient's thighs, with the legs apart, and dispenses with the need for a supporting table. The added weight is negligible.

3. The floor of each compartment contains a rubber mat upon which is stamped the name of the particular instrument intended for it. The most junior assistant has no difficulty in filling it, even at the first operation.

4. Each surgeon can order his own series of mats so that the tools lie to his taste. More compartments can be added for specialists, such as neurological and orthopaedic surgeons.

5. The surgeon himself soon finds it easy to replace each instrument in its separate chamber, or if instruments have to be washed the junior assistant has no difficulty in their return.

6. The assistant can be allotted two compartments on the contralateral side for his scissors and dissecting forceps, and he shares the benefit of instantly finding his tools.

7. No new manœuvre has to be learnt, such as taking down a swinging instrument from a rack. The implements can be instantly picked up by the surgeon or assistant in the manner to which each has always been accustomed.

8. The folded tray can be boiled with the instruments in a common sterilizer.

FIG. 1.

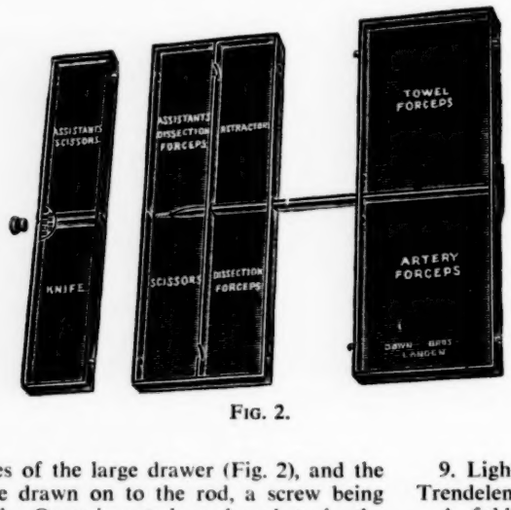


FIG. 2.

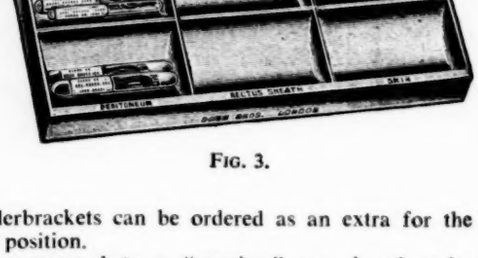


FIG. 3.

9. Light underbrackets can be ordered as an extra for the Trendelenburg position.

A folding as opposed to a " nesting " tray is of easier application in operating theatres where small sterilizers have not to be considered.

A smaller tray (Fig. 3), with six compartments, has been similarly devised for easy access to catgut ligatures and needles when operating in nursing homes. These various compartments are filled by the surgeon before the operation begins. The label at the head of each recess and the curved floors make it a simple matter for any assistant instantly to pick out the requested material.

My thanks are due to Messrs. Down Bros. for their help in production.

BRITISH MEDICAL JOURNAL

LONDON

SATURDAY JULY 8 1939

PREVENTIVE INOCULATION

No one who understands the benefits to be gained by preventive inoculation can be other than profoundly dissatisfied with its status in this country. Of the two such proceedings with the strongest claim to universal application, vaccination against small-pox has been declining steadily for years, while immunization against diphtheria, though more widely available than it used to be, has yet to be generally recognized as a necessity and to reach the bulk of the population. It should be instructive to inquire into the causes of this indifference, and to compare the position in this country with that in others. A factor of prime importance is the security afforded by our insular position, temperate climate, and the watchfulness of port medical authorities; we are so fortunately free from some of the worst scourges and so shielded from dangers which are ever present elsewhere that the strong influence of fear is little felt. But in so far as we deny ourselves protection against those preventable diseases which are always with us, the cause must be sought in ourselves. How far is the half-hearted and often scanty use which is made of diphtheria immunization due to public indifference or objection, and how far to failure on the part of the medical profession in its advocacy and application? Whatever the answer to this question, it is certainly the duty of every practitioner as well as of public health authorities to use their influence to ensure that preventive methods of established value shall at least become known to the public. The attitude of the public themselves must eventually determine the success of any such persuasion, and here a comparison with other countries seems to show that we labour under serious disadvantages. Were it possible to compute the proportion of objectors on principle to any form of inoculation among different peoples, Great Britain would almost certainly top the list. We have active societies constantly fostering the idea that to introduce anything of microbic nature or of animal origin (other than food) into the human body is not only useless and dangerous but almost a form of sacrilege. Although the professed adherents of these extreme and perverse views form only a very small minority, they are the leaven in a far larger mass of doltish prejudice on which nothing short of the fear of death makes any impression. Our cherished freedom in matters of personal conduct, politics, and religion is an example to the world, but where it permits an anti-social attitude in matters not of opinion but of scientific fact it becomes a liability.

Immunization against diphtheria is now compulsory in France, a development presumably reflecting the more common-sense attitude of a thoroughly practical and realistic people. From America comes a stream of reports on enterprising efforts to extend the scope of artificial immunization. Whatever the result, the mere fact that active immunization against poliomyelitis and pneumonia has been attempted is evidence of a greater will to progress and more public willingness to take part in the advancement of preventive medicine. For these two specific efforts there are reasons in the United States which apply here with considerably less force, but no such difference in the circumstances of the two countries affords any excuse for our backwardness in the study of immunization against whooping-cough. We have referred on several previous occasions[1] to the progress of work on this subject, and those who have followed this work must by now be convinced that it has reached a stage demanding practical application on a large scale. Whooping-cough is one of only comparatively few diseases which qualify in every way for preventability by means of a bacterial vaccine. It is due, and due solely, to a bacillus—*H. pertussis*—of which there are fortunately not, as in the case of so many other bacteria, a number of antigenically distinct serological types. Nor is whooping-cough—like a similarly preventable disease, typhoid fever—so uncommon that the risk of contracting it may seem scarcely worth guarding against; on the contrary, it is an exceedingly common disease, and as distressing in its way and as dangerous in its sequelae as any of the other infectious fevers. Its usual occurrence within a narrowly limited age period offers a further advantage to preventive measures. Experience which is now so extensive in the United States as evidently to be almost commonplace shows that preventive immunization with a properly prepared vaccine will protect a majority of children against the effects of natural exposure to infection. A recent study of this kind, resembling both in

[1] *British Medical Journal*, 1934, **2**, 1108; 1936, **1**, 316; 1938, **1**, 459.

method and results others which have gone before it, is that of P. Kendrick and G. Eldering,[2] whose material consisted of 1,185 vaccinated children and 2,397 controls, observed altogether for a period of forty-four months. The number of attacks of whooping-cough per 100 children per year of observation was 2.3 in the vaccinated and 15.1 in the controls, or taking known exposure to infection into account and expressing the results by reference to this, there were 12.8 attacks per 100 exposures to infection in the treated group and 68.5 per 100 in the controls. Recent reviews of the subject by L. W. Sauer[3] and K. F. Maxcy[4] refer to the results of other field trials which almost without exception have achieved success in similar measure. The only aspect of the method about which doubt need still exist is the best method of preparing the vaccine; it seems that some of those used have been comparatively less effective in spite of having been made from smooth strains of *H. pertussis*. Possibly a test of immunizing power in mice, as suggested by G. McL. Lawson,[5] may permit efficacy to be determined by proceedings less arduous and involving less serious responsibility than that of field trial.

If it be granted that this method of immunization has proved its value, how should it be used? The universal immunization of all children regardless of any immediate risk is too much to expect, and, on the other hand, vaccination after actual exposure to infection is generally considered to be of decidedly less value, though others may agree with the experience of Dr. A. Lechner[6] that it serves at least to reduce the severity of the subsequent attack. The answer to this question is that the immunization of as many children as possible should at least be undertaken during any widespread epidemic of whooping-cough, such as we have had in this country during the past six months. Many parents would agree to it in such circumstances, and the authorities of schools would welcome a proceeding which afforded a prospect of bringing the epidemic under even partial control. Doubtless some attempts of this kind have been made recently, but there is a long way to go before we can reach the range, precision, and thoroughness of large-scale immunization as conducted in the U.S.A. We may perhaps ask ourselves whether some element is not lacking in our public health organization which should provide authority and impetus as well as some of the necessary laboratory control in matters of this kind.

[2] *Amer. J. Hyg.*, 1939, **29**, 133.
[3] *J. Amer. med. Ass.*, 1939, **112**, 305.
[4] *Amer. J. med. Sci.*, 1939, **197**, 427.
[5] *Amer. J. Hyg.*, 1939, **29**, 119.
[6] *British Medical Journal*, 1939, **1**, 1154.

THE ABERDEEN PROGRAMME

The programme for the one hundred and seventh Annual Meeting of the British Medical Association, which appeared in the *Supplement* of May 27, will be republished with additions and corrections on July 15. Our Association last met at Aberdeen twenty-five years ago, and in the intervening period its membership has grown from 22,000 to 38,000, while the gain in prestige and official recognition has been at least as great as that in numerical strength. Dr. Thomas Fraser when he takes over the badge of office from Dr. Colin Lindsay on July 25 will become President of a body that has never before wielded so much influence or stood so high with the public and the profession.

Apart from entertainments and ceremonies, which weave in and out of the time-table, the programme divides into two: the medico-political and administrative part, followed by the scientific and clinical part, each occupying roughly three and a half working days. The framework for the many-sided business of the Representative Body is given by the Annual and Supplementary Reports of Council and their appendices, together with the amendments and motions put up by individual Divisions. The work of the year is surveyed by the Representatives, who shape or recast policy for executive action by the Council through its secretariat and committees. The scientific and clinical work of the Annual Meetings is spread over a variable number of Sections: this year there are sixteen, and they meet on Wednesday, Thursday, and Friday, July 26, 27, and 28, the Pathological Museum opening on Tuesday. In planning their business the Sectional officers have kept in mind the advantage of concentration upon a few topics. For some time past the "occasional paper" has rather dropped into the background, and at Aberdeen six or seven Sections will do without it altogether; experience proved that the haphazard acceptance of a medley of papers did not make for a good session. Thus the set debate nowadays bulks largely on the scientific programme, and everyone (or nearly everyone) gets better value for attendance.

An enterprising member, whether in general or in special practice, who looks through the full Sectional bill of fare can find many items to whet his appetite; the task will be to make up a three-day dietary for one person from the sixteen separate lists. Only three "joints" figure this year—and two of them are for Wednesday morning. The largest of these, a joint debate on chemotherapy in relation to the sulphanilamide group of drugs, has been arranged by no fewer than five Sections, and will no doubt attract an audience proportionate

to the subject. Two Sections will combine at the same hour for a discussion of problems of the nutrition of mother and child; and on Friday two other Sections will jointly discuss leptospirosis. Among the single discussions may be mentioned those on medical treatment of peptic ulcer; on prophylactic immunization against measles, scarlet fever, diphtheria, whooping-cough, and influenza; on the treatment of intractable pain from the surgical point of view; on varicosities of veins; on the painful shoulder; on delayed union and non-union of fractures; on the anatomical and physiological basis of physical training; on the third stage of labour; on genito-urinary infection in childhood; on nasal sinusitis in children, with an illustrative film; on headache as an early symptom of nervous and mental disorder; on visual and auditory hallucinations and their significance; on food conservation in relation to national supplies; on ophthalmic services to the civil population in war time; on bronchoscopy in broncho-pulmonary disease; on non-infective enlargement of lymph nodes; and on anaesthesia in dentistry and in genito-urinary surgery. The Section of Physiology and Biochemistry, meeting alone, will discuss the control of respiration, the pathology of chloride metabolism, and the relation between anterior pituitary lobe and carbohydrate metabolism; the Public Health Section will consider medicine and the State and the future of medical practice; and the Section of Radiology has two topics—thorotrast in the diagnosis of cerebral lesions and radiotherapy for radiosensitive tumours.

Between them the sixteen Sections at Aberdeen will hold some thirty morning sessions, each of about three hours. In the afternoons there will be clinical demonstrations, both medical and surgical, at the Royal Infirmary; visits to the Maternity Hospital, the Rowett Institute, and the Torry Research Station; a clinical meeting of the Scottish Otological Society; a film on the treatment of retinal detachment; and grouped exhibits on view in the anatomical department of the University. The *British Medical Journal* will have a reporter in every Section, who (with help from the officers and the speakers) prepares an abstract of the proceedings of each session for publication in our columns soon afterwards. In this way we give the members who cannot attend, within a few days or weeks of the event, a concise but readable account of what is said. The full text of most of the opening papers will be published among original articles between the end of July and December. Advance proofs of these will not be circulated beforehand to participants in the debates, but the Council of the Association has authorized the supply of brief summaries of each opening paper to secretaries of Sections for distribution to invited speakers and others who ask for them. Openers have willingly co-operated in the new arrangement, which, while relieving pressure in the editorial office and the printing works during two busy months, should clarify the main points for discussion and so put more life into the proceedings.

CHEMOTHERAPY IN TUBERCULOSIS

It was reported over a year ago by Rich and Follis that large doses of sulphanilamide retarded the progress of experimental tuberculosis in guinea-pigs. The results of later studies are somewhat conflicting, probably because some of them were not conducted on an adequate scale or by the laborious methods which alone are capable of producing significant results in such a connexion. The general impression conveyed by all this work is that the disease can be retarded to some extent, but of course not controlled, by chemotherapy: it also appears that infection with the human type of tubercle bacillus is more amenable to treatment in the guinea-pig than bovine infection. Dr. Konrad Birkhaug, who describes his work on page 54, has carried this matter a stage further by varying the method of experiment somewhat and controlling the results with extreme care. The tubercle bacillus used, of which each guinea-pig received an exceedingly small dose, was of the bovine type. Half the inoculated animals were then treated, not with sulphanilamide, as in most previous experiments, but with prontosil soluble. The effect of treatment was assessed in several ways, and each of them is submitted to statistical analysis. Whether judged by changes in body weight, by the behaviour of the blood picture, or by the extent of the disease found post mortem and the numbers of bacilli in the lesions, it seems clear that this form of chemotherapy has a restraining influence on the development of the disease and for the time being mitigates its effects. While even this partial success, particularly in an animal which is incapable of actual recovery from infection with virulent tubercle bacilli, is a fact of great interest, and possibly an augury of better things to come, it must not be supposed that similar treatment of the natural human disease will necessarily give beneficial results. Indeed, it is exceedingly doubtful whether the average chronic case would respond in any way, except in so far as some secondary infection was brought under control. Everything that we know about the chemotherapy of bacterial infections seems to show that its main effect is in checking bacterial spread and in preventing the growth of bacteria which have newly invaded fresh tissue. This is not hard to understand, for when a micro-organism is first carried to a fresh part it is still surrounded by blood or tissue fluid containing the drug in full concentration. Bacteria in an abscess cavity, on the other hand, are less accessible, and in the fibrotic and avascular lesion of chronic tuberculosis they must be less accessible still. This contrast between the amenable type of spreading infection and the resistant

type of localized infection finds a close parallel in the difference between experimental tuberculosis in the guinea-pig and the chronic forms of the natural disease in man. The spread of tubercle bacilli in the guinea-pig is rapid, and the effect of chemotherapy is presumably to retard their development in newly invaded tissue, and perhaps in some foci to prevent it altogether. If these suppositions are correct an indication for chemotherapy in the human disease might be the fresh dissemination of bacilli when this can be recognized clinically. The treatment of miliary forms of the disease and of tuberculous meningitis is perhaps worth a trial. With these doubtful exceptions, it would probably be unwise to expect any useful results from applying these experimental findings in the clinical field, and certainly very difficult to assess such results if any appeared to accrue. It is always possible that some new compound may be discovered which has a more pronounced action on a particular micro-organism, and the tubercle bacillus need be no exception to this; but the nature of the disease is such that any too sanguine expectations will only court disappointment.

THE PASSING OF THE CEMETERY

The advantages of cremation from the point of view of public amenity were strongly argued by Lord Horder in his presidential address to the Cremation Section of the Joint Conference of Burial and Cremation Authorities at Southsea. The annual number of cremations has multiplied nearly fivefold during the last ten years, and there are now about fifty crematoria in the country, whereas ten years ago there were only eighteen. Lord Horder entered upon some calculations leading to the conclusion that within the next twenty years the annual number of cremations may be a quarter of a million, representing 50 per cent. of the present death rate. This change in public custom will have many advantages, visible and invisible. For one thing, it will result in a great saving of land in urban areas at present sterilized by cemetery uses. Lord Horder put it in a crisp phrase: that each crematorium will save the space of one football field every year. He hoped also to see a lowering of funeral costs. People have been led to believe that cremation is an expensive process, available only to the wealthy. He mentioned undertakers who have charged fabulous prices for the construction of cremation coffins and hospital doctors who have asked excessive fees for signing the requisite medical certificates for cremation. The great increase in the number of cremations will enable all cremation costs and fees to be lowered and a considerable economy to be effected in the disposal of the dead. Lord Horder also pointed out that the reform of the law is long overdue. The law on cremation dates back to 1902, and the statutory forms now in operation are similar to those first drawn up in 1885 and bear the stamp of fear and inexperience. "The law which permits a body to be buried without the certifying doctor seeing the body after death, but demands two medical certificates and the examination of the dead body in the case of cremation, is difficult to defend in terms of logic; and the proviso that, while a cemetery may be established outside a radius of 100 yards from a dwelling-house, a crematorium must be at least 200 yards from a dwelling-house, is plainly absurd." He believes that legislators of the future will recognize the value of cremation in all its aspects and will seek to encourage its practice by placing cremation and burial upon the same footing and demanding the same conditions and observances for both. This is a policy that has been advocated by the *British Medical Journal* for the past sixty-five years. But it was from the aesthetic point of view that Lord Horder advanced his chief arguments. Cremation, he said, should bring about not only a more rational attitude towards death but a new conception of art as applied to memorials. The new conception is already in existence and was beginning to make an important contribution to the beautifying of the countryside. Efforts are being made to popularize trees and shrubs as memorials to those whose ashes are either planted beneath them or scattered in the garden. One certainly looks forward with pleasure to a time when gardens of remembrance will take the place of unsightly acres of marble, generally lugubrious, sometimes grotesque. If another Thomas Gray should write a new "Elegy" he would not find these healthier surroundings less inspiring to his muse. A garden of remembrance, by the way, almost adjoins Stoke Poges churchyard. Lord Horder thinks that with this development there might well come about a wholesome change in our attitude towards death. Rows of flowering trees flanking the roads or the streets of towns would constitute admirable memorials to the dead of a particular locality, for they would beautify the place in which the dead had lived and recall them to mind. One common factor, he said, united those who believed in cremation: the desire to establish a system of disposal of the dead which should preserve the highest reverence for the departed without detriment to their survivors; which should combine economy with beauty and reflect in its absence of dogma the inherent love of freedom of our people. But he was against making cremation compulsory, preferring to trust to a process of education of the public, aided by economic circumstances.

STERNAL PUNCTURE

The sternal puncture needle, like the gastroscope and the electro-encephalograph, has opened to the clinician a new territory which has been widely explored in recent years. Bodley Scott[1] in one of the latest and best articles on the subject bases his observations on analysis of some 250 personal cases and a review of the literature with more than 250 references. In the past the diagnostic value of sternal puncture has been overstressed. Its main value is in teaching the haematologist to regard blood diseases as pathological processes and in showing the origin of the abnormal cells which circulate in the blood stream. Its most frequent use in practice is in the diagnosis of obscure anaemias of high colour index which have failed to respond to liver treat-

[1] *Quart. J. Med.*, 1939, **8**, 127.

ment and are therefore referred for expert opinion. Careful inspection of the peripheral blood smears in many of these cases is enough to show that the patient is suffering from a form of leukaemia in which the relative and total number of abnormal cells in circulation is small. In doubtful cases of this kind the discovery of large numbers of immature white cells in smears from a sternal puncture will clinch the diagnosis of leukaemia, but it does not seem to be proved that a myeloblastic marrow always necessitates a diagnosis of myeloid leukaemia (English and American haematologists differ widely on this point), and it seems to be certain that a normal sternal puncture does not exclude lymphatic leukaemia. Bodley Scott gives a very clear account of the megaloblastic degeneration of the bone marrow which is pathognomonic of pernicious and allied anaemias, and separates them by an easily recognizable characteristic from the heterogeneous group of anaemias of high colour index which do not respond to treatment by liver or allied haematinic principles. The one condition of all others in which sternal puncture appears to have diagnostic value—in which the diagnosis may come as a surprise where it had not been expected[2]—is myelomatosis. Although many different types of myelomatosis have been described in the past, the general impression to-day is that the myeloma cell is a specific cell type with at any rate a superficial resemblance to the plasma cell, though the cells may vary in maturity and degree of differentiation from case to case. It must be remembered that we are using the term "myeloma" in its precise sense as a tumour of the bone marrow, which must not be confused with the myeloid sarcoma or giant-cell tumour which arises from the bone reticulum. Sternal puncture in myelomatosis shows a varying proportion of large, round, or ovoid myeloma cells. Bichel and Kirketerp[3] show that true solitary myeloma is excessively rare, and that in the great majority of cases there is diffuse involvement of the bone marrow, however little the symptoms or the radiographs may suggest this. They therefore advise that sternal puncture should be performed in all cases of bone disease where the diagnosis is uncertain. Carcinomatosis of the skeleton also may be sometimes diagnosed by sternal puncture, even to the extent of recognition of the primary focus of the disease.

SUN-SPOTS AND DIPHTHERIA

To correlate sun-spots with diphtheria savours more of astrology than of epidemiology, but taken over a sufficiently wide field, in time and in space, it seems that there may be some connexion between these apparently unrelated phenomena. Belák[1] has recently undertaken an analytical survey of the occurrence of diphtheria in a number of Continental cities. This shows that children under school age—chiefly of 2 to 3 years—are more prone to the disease than older children, although their exposure to infection, in the home as against the school, is more limited; that the autumn and winter frequency of diphtheria bears no relation to school life at these seasons; and that the incidence curve shows a definite eleven-year pulsation similar to that of the sun-spot curve, the co-efficient of correlation being + 0.9. It is suggested that the "vegetative tonus" of host and/or parasite is subject to cosmic influence. Belák bases his argument on the fact that the ozone content of the stratosphere increases with the number of sun-spots and this excess of ozone absorbs more of the short-wave (ultra-violet) rays than usual, thus probably shortening the violet end of the spectrum at the earth's surface. The relative shortage of this form of solar energy may conceivably alter vitamin activity in the body and so lower resistance to the onset of the disease. In contrast to these observations in Austria and Hungary it is pointed out that in countries where much milk and fish is consumed—that is, where a high vitamin diet is habitual, as in Sweden, Denmark, and Finland—the diphtheria curve does not follow the sun-spot curve. Whether the causative agent is affected in the same way or not, or whether variations in virulence are subject to influences of this kind, it is difficult to say. Such points could only be determined by vital experiments, in which presumably the sensitivity of the test animals would also be altered. Belák argues further that preventive measures based on the "contact" theory cannot attain the desired result, since exposure to infection alone does not necessarily determine the onset of the disease. If susceptibility depends upon a general and not a specific factor, then immunization can only alter the form of manifestation and not the essentials of the disease, which may then appear in another guise. He suggests that research should be directed towards solving the question of cosmic influence upon susceptibility to infection in general, and that the study of nutrition as it affects the population at large may help towards this end. From these observations it is to be presumed that Belák correlates high susceptibility with low vitamin activity, but whether the latter depends so much upon sun-spots as his curves suggest is a matter of doubt. It seems more likely that the quantity rather than the quality of sunlight is the main factor, for it is well known that diphtheria is more prevalent during the dull months of the year and that in sun-baked lands it rarely occurs.

[2] *Gaz. d. Osp. e. d. Clin.*, 1938, **59**, 807.
[3] *Acta Radiol.*, Stockh., 1938, **19**, 487.
[1] *Mschr. Kinderheilk.*, 1939, **77**, 190.

ORTHOPAEDIC UNIT FOR CHINA

We publish this week in our correspondence columns an urgent appeal for funds to provide a teaching unit well behind the Chinese lines and a surgical director to instruct Chinese surgeons in orthopaedic surgery so that they may deal more effectively with the enormous numbers of wounded at other military and civilian hospitals. Members of the British Orthopaedic Association have given more than £1,100, but they cannot themselves subscribe the whole sum required—£3,500. The cause is one that will surely commend itself to many readers, and it seems most appropriate that the orthopaedic unit will be linked with the name of Robert Jones in the title of its surgical director.

SLEEP CHARTS

BY

G. de M. RUDOLF, M.R.C.P., D.P.M.

Although the necessity for an adequate quantity of sleep is generally recognized, charts for recording the amount do not appear to exist. A standard quantity of sleep cannot be assigned for any person or age, and tables setting out the amount required at each age appear to be fallacious: means are all that can be relied upon. Thus Laird found, in 509 men, that the hours of sleep obtained varied from five to ten hours a night, with only slight differences between age groups 25 to 75 years. The hours at which sleep takes place may be of more importance. Stoeckmann claims that sleep before midnight is more restorative than sleep after, thus confirming the old-standing belief. Depth of sleep, as measured by auditory stimuli required to waken the sleeper, varies during the sleep period, being greatest within the first and less during the last part.

In practice the quantity of sleep and the hours during which sleep is obtained vary with each individual, some requiring less, others more, but hitherto there has been no means of readily recording how long an individual sleeps. For instance, nurses report that a patient has had a good night. This may mean that, (*a*) as compared with the nurse's own idea of her own sleep, the patient has slept as much or more; (*b*) the patient has slept more than is usual for him; (*c*) he has slept longer than other patients; or (*d*) he has lain quietly awake with his eyes closed and the nurse has been mistaken in assuming he was asleep.

In order to attempt to obtain reasonably accurate records of sleep a chart has been drawn up divided into half-hourly observations. The observer must place a dot or a stroke in each square. Each record is thus an individual note, so that the observer cannot make one stroke for several observations. The night is broken up into two lines, so that the observer's train of thought is also broken. As, especially in darkened wards, a patient may lie awake but appear to be asleep, the co-operation of the patient is essential. The nurse is therefore instructed to make a slight sound on approaching the bed and the patient is asked to open the eyes, raise a hand, or move the head, to show that he is awake. If the patient fails to co-operate, observation should be stopped. Consequently the chart is unsuitable for semi-conscious patients or for those who are markedly defective or psychotic.

The charts are printed for me by Messrs. John Wright and Sons Ltd. of Bristol. They were drawn up in connexion with a Fellowship of the Colston Research Society, to which my thanks are due.

SLEEP CHART

NAME SEX DATE OF ADMISSION AGE ON ADMISSION

DIAGNOSIS

DATE	TIME	12.30	1.0	1.30	2.0	2.30	3.0	3.30	4.0	4.30	5.0	5.30	6.0	6.30	7.0	7.30	8.0	8.30	9.0	9.30	10.0	10.30	11.0	11.30	12.0	Total	Notes, Medicines, Apparent Causes of Sleeplessness, etc.
	A.M.																										
	P.M.																										
	A.M.																										
	P.M.																										
	A.M.																										
	P.M.																										
	A.M.																										
	P.M.																										
	A.M.																										
	P.M.																										
	A.M.																										
	P.M.																										
	A.M.																										
	P.M.																										

INSTRUCTIONS

1. The patient should be instructed to open the eyes, raise a hand, or move the head on the approach of a nurse.
2. Observations should be made by approaching the bed and making a very slight sound, such as rustling the apron. The patient should not be touched or addressed.
3. If the patient appears to fail to co-operate when awake, observations should be discontinued.
4. When the patient is asleep a dot should be placed in the appropriate space; when awake, a diagonal line thus ⧹. If the patient is both awake and asleep after a half-hourly observation, a dot and half a diagonal line should be placed in the space of the next observation, the second sign corresponding to the state of the patient at the second half-hourly observation.

The following medical promotions in and appointments to the Venerable Order of the Hospital of St. John of Jerusalem are announced in the *London Gazette* of June 23. As Knight: Urban Marks, M.R.C.S., L.R.C.P. As Commanders: Lieutenant-Colonel F. Romer, M.R.C.S., L.R.C.P., Sir Henry J. Gauvain, M.D., F. C. Bottomley, O.B.E., M.D. As Officers: H G. Ramsbottom, L.R.C.P. and S.Ed., N. H. Kettlewell, L.M.S.S.A., E. J. Burnett, M.B.E., M.B., D. H. Griffiths, M.R.C.S., L.R.C.P., G. L. Pierce, L.R.C.P. and S.Ed., R. J. Clarke, M.B., Lieutenant-Colonel E. S. Goss, *M.C.*, M.R.C.S., F. J. Bach, M.D., J. C. Glen, L.R.C.P. and S.Ed., Major E. S. B. Hamilton, *M.C.*, M.B., E. Hoerman, M.B., A. Croll, M.D., F.R.C.S.Ed., E. F. White, F.R.C.S., Major C. Wilson, M.B., C. P. Gaboury, M.D., C. J. A. McKillop, M.D., Major W. E. L. Sparks, M.D., Lieutenant-Colonel R. H. Candy, C.I.E., Lieutenant-Colonel N. Briggs, Jane P. H. G. Brown, M.B. As Associate Officers: Captain M. Hafiz-uddin, L.R.C.P., M.R.C.S., Lieutenant-Colonel A. N. Bose, O.B.E., M.D. As Serving Brothers: F. L. Richard, M.B., J. Wells, M.R.C.S., L.R.C.P., J. Lamberton, M.B., A. H. Penistan, M.B., Lieutenant-Colonel W. George, *M.C.*, T.D., M.B., Major C. M. Forbes, M.B., J. W. Watterson, M.B., Major N. W. Hammer, M.R.C.S., L.R.C.P., W. D. Jenkins, M.R.C.S., L.R.C.P., E. C. Malden, M.B., E. R. Weaver-Adams, M.B., J. Macfie, M.B., W. C. Lyons, M.B., I. Way, M.B., H. W. Ward, M.B., A. R. Home, M.B., A. U. Sheth, M.B. As Associate Serving Brothers: J. Lovius, M.B., Major D. N. Gupta, L.M.S., P. C. Datta, F.R.C.S., P. N. Gokhale, F.R.C.S., M. C. Madhok, M.B. As Serving Sister: Sara L. Westlake, M.B.

WAR WOUNDS AND AIR RAID CASUALTIES

The following is one of a series of lectures on the Treatment of War Wounds and Air Raid Casualties recently delivered at the British Postgraduate Medical School

AMPUTATIONS UNDER WAR CONDITIONS

BY

C. MAX PAGE, D.S.O., F.R.C.S.

There was a time when amputations formed the major part of war surgery, and they still represent a very important section of this work. In the pre-antiseptic period gross suppuration was the rule, and the art of the limb-maker was but poorly developed. In consequence the experience and methods of the older surgeons have but little bearing on our practice to-day. The intensive experiences during the great war and the subsequent study in this country of some fifty thousand amputés under the Ministry of Pensions authorities have provided us with evidence from which we were able to mould our current practice. We have experimental evidence, both in regard to the technique of amputations and as to the value of stumps of various types. It may be admitted here, however, that the problems of the phantom limb and the development of painful nerve bulbs remain to be solved.

The indications for amputation cannot be considered in detail in this paper. The decision will always rest on the judgment of the individual operator. Some general observations, however, on the factors which govern this important decision will not be out of place. In the pre-antiseptic days any compound fracture of a limb due to a missile was regarded as an indication for prompt amputation. Under modern conditions this is by no means the case, and primary amputations in the war were only carried out when there was gross injury, not only to the bone but to the soft parts as well. In the case of missile wounds of the lower limb, particularly those below the knee-joint level, I cannot help thinking that our optimism in regard to conservative treatment carried us too far. Anybody who worked in a pensions hospital for five or ten years following the war must have been struck by the large number of compound fractures which required surgical treatment over a period of years. The end-results may sometimes have been brilliant. More often they left an indifferent limb, which remained liable to break down at intervals under stress. The result in this class of cases should, in my opinion, be considered not only in relation to the wound treatment but to the general effect on the mentality of the patient. Long hospitalization and repeated operations will disintegrate the initiative and enterprise of any but the most robust constitutions. I believe that a primary amputation should be carried out in those cases where, from a missile injury, comminution of the bone is such that prolonged bone infection and delayed union are likely to occur, especially in those instances where the damage is done in the lower half of the leg. I do not think the same attitude towards compound fractures of the upper limb is justified. In the lower limb a good stump in which suppuration has not occurred can be early fitted with a most satisfactory prosthesis. In the arm nothing can replace satisfactorily the loss of the hand.

General Principles of Amputation

The principles which should guide us in carrying out an amputation will vary according to whether section is made through infected tissue or whether first-intention healing can be anticipated. When dealing with the latter state of affairs the result obtained should be a final one, and great care should be taken so to carry out the primary operation that the stump may be durable and suited to the modern artificial limb. I will now consider the general technique of amputation under the headings of flap formation, section of bone and nerves, and control of the major blood vessels.

Flaps.—If the nutrition of the flap be the first consideration the simple circular flap is most satisfactory in this respect. In general, therefore, flaps should be planned on this basis. There can be little doubt that long flaps tend to be unsatisfactory from the point of view of nutrition and innervation, although they may sometimes be employed with success. Though the circular flap in its exact form may be seldom used, it should remain the ideal of all flap design. In practice the circular flap will often be cut obliquely, and vertical cuts may be made in it to make it more manageable when the bulk of the limb requires it. Such side cuts will convert a circular flap into antero-posterior or lateral ones of approximately equal size. The total length of flap cut, whether circular or not, as measured on two opposed aspects of the limb, should not exceed in length a diameter and a half of the limb at the level of section. Fascia and muscle should only be included in the base of a skin flap so far as is necessary to maintain its nutrition. In the final stump, muscle and fascia, owing to their wasting and shrinkage, are not present at its termination, nor is their presence desirable. The end of a stump which is to carry an artificial limb should be covered by skin and subcutaneous tissue that is just mobile on the healed bone. The termination of a stump should be tapered and not bulky. The striking exception to the modified circular flap generally employed is particularly noticeable in the Syme amputation. Some critical observations on this are made below.

Bone Section.—Bone should always be divided so as to give an even and more or less rounded-off end to the stump of the maximum diameter possible. Projection of a bone of small diameter, such as the fibula, is a very undesirable feature in a stump. Occasionally a good-sized artery is divided in the bone, and this can usually be occluded by crushing the bone on to it. Suture of muscle over the end of the bone is sometimes practicable. Alternatively a small amount of bone wax may be used. I believe the employment of wax as a routine to be unnecessary. In order as far as possible to avoid the formation of bone spurs the periosteum should be cleanly cut before the bone is sawn through and scraped away distally so as to expose the compact bone for section.

Nerve Section.—There is no means by which the formation of some type of end bulb can be prevented. Pain in end bulbs most often occurs when suppuration has been present in a stump and when the cut ends of the nerve are so situated that they are exposed to pressure. In larger nerve trunks the latter tendency can be avoided by cutting the nerve an inch or so above the line of section of the muscle. I do not think severe traction of a nerve trunk or very high section is desirable. It is generally accepted that the nerve should be divided clean across

with a sharp knife after crushing. I do not favour ligaturing the nerve, except so far as this may be necessary to control bleeding. In order to prevent post-operative pain the stump of the nerve may be injected with 90 per cent. alcohol before closing the flaps. Prevention of post-operative pain is most desirable: in a sensitive patient its occurrence may well be the starting-point for the development of a painful and troublesome stump later.

Control of Major Vessels.—The old authorities advocated the isolation of the main vein or artery before ligature. There is not much to be said against the practice, but it is possible that in infected cases the local upset in the blood supply may favour secondary haemorrhage. I can say, from a practical standpoint, that the ligature of the two vessels together gives satisfactory results.

Amputations in Presence of Sepsis

If the amputation is through a septic field, or if there is active sepsis below the line of section to which the patient is showing little resistance, suppuration in the stump is to be anticipated. In such circumstances it is most probable that the primary amputation will be followed by a later final one. In this case the primary amputation will be designed so as to minimize the risk of spreading infection and to leave enough tissue for a satisfactory stump to be formed at the secondary amputation.

At one period during the war the simple guillotine operation was advocated. In the case of a virulent spreading gas infection this may well be sound practice. In my opinion, however, in its crude form it is seldom necessary. The guillotine stump is a depressing one to the patient; it is painful for dressing, and is more liable to secondary haemorrhage than the more protected type. In these circumstances I advocate the use of a short circular flap the length of about half the diameter of the limb and cut slightly obliquely so that one flap overhangs the bone end. Few, if any, sutures should be employed, and the cavity is packed with paraffin gauze. This pack should be left *in situ* for four or five days, or longer if the general condition is satisfactory.

Drainage.—It is customary to drain amputation wounds, whether carried out under clean or septic conditions. When sepsis is not present the drainage is merely to prevent the development of a haematoma, and for this purpose a rubber dam may be left in for twenty-four or forty-eight hours. Some surgeons prefer to dispense with drainage altogether in clean stumps, but it is certainly difficult to control oozing by pressure in the loose wound at the end of an amputation stump.

Regional Amputations: Lower Extremity

The ideal types of final amputation may now be discussed. By final amputation is meant one carried out as a primary measure when healing by first intention is anticipated or when a second reamputation is carried out after the infective process has been controlled. In these circumstances a durable stump suited to the standard artificial limb should be the aim. In the lower extremity, where prosthesis is of the greatest importance, the most satisfactory amputations, giving good functional results, are: (1) the Syme amputation; (2) below-knee seat of election; (3) above-knee seat of election; (4) amputation at the hip-joint. Amputations at other levels for one reason or another may be carried out, but none of them gives full functional value, and some, I think, should be definitely condemned as either crippling or unlikely to stand long wear. Into this group fall the Chopart and Lisfranc amputations and below-knee amputations with more than seven inches of tibia. If the views and methods of the English limb-maker be considered, any thigh amputation longer than ten inches must also be condemned. It is true that in America and Germany the Stokes-Gritti amputation is still considered to give a useful stump; English experience, however, is not in its favour.

THE SYME AMPUTATION

The value of this amputation has been the subject of a good deal of controversy, and I will limit my remarks on it so far as possible to observed facts. If completed cleanly and neatly with a firm well-fitting heel flap it gives excellent service in children. It provides a true end-bearing stump which is very convenient at this level. It will carry an effective if not elegant prosthesis. If the bone section is carried out at the classical level (a quarter to half an inch above the ankle-joint) it does not allow of the fitting of an artificial limb with a symmetrical ankle. This objection is important to women from a cosmetic standpoint, and is partly overcome if the amputation is modified by using a small heel flap and cutting the bone one inch above the ankle-joint level.

In men the average results of this amputation during the war were unsatisfactory. The Ministry of Pensions circulated in 1934 an analysis of fifty-four Syme amputations. It was found that thirty-eight of these cases had undergone reamputation between 1920 and 1933. In a group of twenty-two cases, investigated in relation to their durability, it was noted that only six took full end-bearing for ten years or more. The average period during which end-bearing could be tolerated was seven and a half years.

This failure of the Syme carried out under war conditions was put down in about 25 per cent. of the cases to the presence of sepsis at the time of operation. Displacement of a bulky end flap was another cause of trouble. The development of callosities and ulceration, especially in relation to the anterior scar, was often noticed. Painful nerve bulbs are as common and as troublesome in this amputation as in stumps at other levels. Nutritive disturbance from a poor circulation was often met with. The above complications are sometimes overcome without reamputation by fitting an artificial limb bearing on the tibia or even the tuber ischii.

I advocate the Syme in children, and it may be worth while in young men and women provided there is no sepsis. It should be noted that in children this amputation involves the removal of the lower epiphyses of tibia and fibula, and so affects subsequent growth of the stump. At operation great care should be taken to maintain full nutrition of the heel flap; that flap should be shorter than the classical form, and the bone section should be made about an inch below the ankle. As many nerves as can be recognized should be cut short in the flaps. In the presence of sepsis and in the elderly the amputation is to be condemned. It is also unsatisfactory when oblique weight-bearing is imposed by the presence of a bow leg.

BELOW-KNEE SEAT OF ELECTION

This amputation can now be clearly defined. Ideally the bone section should leave six inches of tibia in the average adult and seven inches in a tall person. The measurement is taken from the upper border of the tibia

at knee level. Longer stumps give no increase in functional value and are liable to nutritional trouble. The shortest below-knee stump of functional value is about three inches. If less tibia than this must be left an above-knee amputation should be performed. The design of the flaps for this amputation may often be governed by the conditions for which it is carried out. They should always be planned with the idea of maintaining so far as possible good blood supply and a normal innervation.

ABOVE-KNEE SEAT OF ELECTION

It is customary to measure this stump from the crutch or pubic bone. The ideal length is nine inches for short and ten inches for tall patients. Greater length than this has no functional value and impedes the fitting of the best type of modern symmetrical limb. The shortest length of an above-knee amputation that is of functional value in controlling an artificial limb is about three inches. Less bone than this, however, should be left, as some bone in the stump facilitates the fitting of a tilting-table type of prosthesis. Modified circular flaps amounting to approximately equal length antero-posterior flaps give a satisfactory result and are generally practicable.

AMPUTATION AT THE HIP-JOINT

This amputation is seldom carried out, and it is only necessary to advise that it should be planned to leave a convex and not a concave surface for the fitting of a limb. To this end, unless there is some contraindication, the head of the femur should be left in the acetabulum, the neck of the femur being sawn through.

After-treatment of Leg Amputations

After above- and below-knee amputations flexion at hip or knee should be avoided. The development of fixed flexion at either of these joints prevents limb-fitting till deformity has been corrected. The prevention of habitual flexion is particularly necessary in septic cases, where treatment in recumbency is prolonged. The thigh or leg stump should lie straight while the patient is confined to bed, and when healing has progressed far enough exercise of the stump should be carried out. As soon as the wound is soundly healed the stump should be prepared for the fitting of an artificial limb. In the thigh a temporary pylon applied a month or so after amputation is a useful measure to this end. In the leg this method is not so easily applied. Active exercise, massage, and elastic pressure applied to the stump will, however, reduce the oedema and render the stump ready for the fitting of the final artificial limb in a month or so.

Regional Amputations: Upper Limb

In the upper limb the prehensile value of the hand is irreplaceable by any prosthesis hitherto invented. In consequence a conservative attitude in regard to amputations in either the hand or the arm should always be adopted. When amputation is decided on the determination of the ideal level for section is not so rigid as in the lower extremity. I will, however, give such details as to useful levels for division of the bone as meet with general acceptance.

Forearm.—Disarticulation at the wrist-joint or bone section immediately above it gives an unsatisfactory stump, difficult to fit with a prosthesis. The ideal is to retain six to seven inches of the radius and ulna. The minimum length of these bones which allows a good-fitting and useful substitute is from two to three inches. If two inches of forearm bone cannot be left the patient will be better off with a supracondylar amputation. The flaps for amputations in this area may conveniently be approximately circular. The central scar overlying the bone, if mobile, is satisfactory in the upper extremity. The ingeniously devised so-called kineplastic stumps have proved a failure. Their intention was to use the forearm muscles independently to act on an artificial hand.

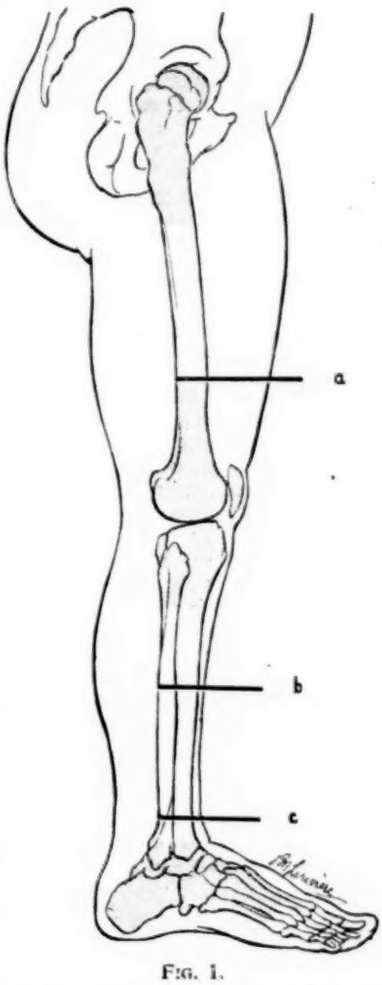


FIG. 1.

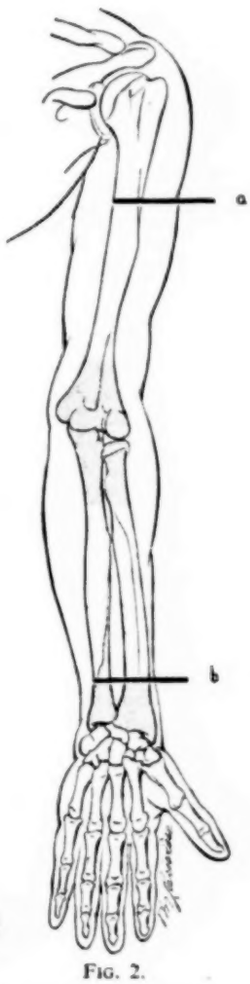


FIG. 2.

FIG. 1.—Diagram indicating satisfactory levels for bone section in amputations of lower extremity. Section of bone in the shaded areas leads to unsatisfactory stumps. a = Ideal level for above-knee amputations—9″ to 10″ of femur measured from the crutch. b = Ideal level for below-knee amputations—5″ to 7″ of tibia. c = Level of bone section for a modified Syme—the most useful amputation about this level.

FIG. 2.—Diagram showing useful levels of bone section in upper extremity amputations. Section of bone in the shaded areas leaves unsatisfactory stumps. a = Section above this level leaves a stump to which an artificial limb cannot be fitted. b = Most useful level for forearm amputations.

Upper Arm.—Disarticulation at the elbow, like similar operations at the wrist and knee, does not give a useful stump. The best upper-arm stump is one in which the humerus is divided some two inches above the epicondyles. Any length of humerus, however, less than this should be left, if only for cosmetic purposes; anything less than four inches of humerus measured from the tip of the acromion cannot be fitted with a useful artificial limb. Even circular flaps are ideal for upper-arm amputations, a central scar being most satisfactory.

Conclusion

It may appear that the directions for lower extremity amputations are somewhat dogmatic. But I would emphasize that they are based on the opinions of most of those surgeons and limb-makers who have had under observation the large amount of material provided by the war.

I would like to acknowledge my indebtedness to the medical staff of the Pensions Ministry for some statistical information, especially in relation to the Syme amputation. I should also like to thank Mr. Desoutter for valuable advice on the best levels for lower extremity amputations in relation to the fitting of artificial limbs.

WORK OF THE BRITISH RED CROSS SOCIETY

The report for 1938 of the British Red Cross Society opens with an account of the sixteenth International Red Cross Conference, held in London, which was attended by representatives of more than sixty Red Cross Societies, Governments, and kindred organizations. Later in the year the international crisis caused a considerable increase in the work of the Society. Some 3,000 members were warned for duty at short notice, while others were actually mobilized with anti-aircraft units. Throughout the country branches have actively co-operated with local authorities. Many courses of lectures have been given to the general public, while Red Cross instructors have also been occupied in teaching A.R.P. officials, air raid wardens, and fire brigades, and in demonstrating the nature of air raid precautions. The Society was responsible for the dispatch of large quantities of warm clothing, blankets and rugs, cocoa, chocolate, milk foods, and cod-liver oil for the use of Czech refugees. In Spain co-operation continued with the International Red Cross Committee, resulting in the establishment, in the chief centres of the contending parties, of bureaux responsible for the receipt and distribution of hospital supplies, drugs, and surgical instruments. An Information Card Service was also set up, whereby many thousands of people were able to secure news of friends and relatives. The Society continues to co-operate with the British Fund for the Relief of Distress in China. In addition to large quantities of medical supplies some forty bales of clothing and comforts were sent out each week during the period under review, several shipping companies carrying the goods free of charge.

The Joint Council

The annual report of the Joint Council of the Order of St. John and the British Red Cross Society contains nine departmental reports and two sections devoted to financial matters. The former group includes the hospital library report, which records an increasing demand for books from all kinds of hospitals. Requests are frequently made for technical books, many patients wishing to study in hospital with a view to improving their chances of employment on discharge. There is also a continuous demand for foreign books, especially French, German, Italian, modern Greek, Hungarian, Spanish, and Yiddish. The report stresses the importance of collaboration between architect and library expert in planning hospital libraries, citing the case of the new Westminster Hospital, where this procedure has been advantageously adopted. Another new development is the institution of a band of voluntary librarians at the Central London Ophthalmic Hospital, which, it is believed, is the first eye hospital in England to have a voluntary service of librarians to read aloud to the patients. The report mentions the special need on the part of mental hospitals for adequate libraries, for in these institutions properly directed reading may have a definite therapeutic value. With regard to hospital libraries in general it is maintained that organization and inspection by experienced librarians are matters of importance, and that the appointment of an inspector for each county, or at least for several groups of counties, would ensure a higher and more uniform standard.

Nova et Vetera

THE OLDEST MEDICAL MANUSCRIPT WRITTEN IN ENGLAND

It is claimed in the Press, though not in the auction catalogue, that the Latin MS. to be sold by Messrs. Sotheby on July 12 on behalf of the Penzance Library is the oldest medical treatise written in England. This interesting relic consists of eighty-nine leaves of vellum written in red and black in extremely careful and beautiful Gothic script in the Latin tongue. The MS. is full of the contractions which make the deciphering and translation of such documents a job for scholars and not for amateurs; but the actual lettering is a masterpiece of meticulous care and penmanship. The auctioneers regard the date of the manuscript as roughly A.D 1250; they do not offer an opinion as to the date of the binding of tooled black calf leather over old oak boards, which may conceivably be as old as the book, but seems more likely to be about two or three centuries later. On the inside of the front cover is the book-plate of Thomas Dawson, with an autograph note: "Presented to me by my late brother-in-law G. Aspinall about 1836. T. Dawson."

The work contains six separate treatises, of which the first and most important is the *De Chirurgia* of Albuhasim (Albucasis, Albucasim); this occupies forty-four leaves, three of which are missing. The initial letters of every paragraph are illuminated in red and blue, and many of them are heightened with gold also. These are most carefully and artistically executed; but the illustrations of the text are very crude in comparison, virtually nothing more than outline diagrams in red. There are two human figures (back and front views) showing how and where a surgeon may apply the cautery for various diseases, and a very large number of drawings of surgical instruments, including (besides the inevitable cauteries) cannulas, scissors, catheters, specula, spatulae, vulsella, bistouries, scalpels of many kinds and shapes, hooks, fistula knives, and so forth.

Albucasim, it will be remembered, was a Moor of Cordova (1013–1106), whose textbook of surgery was the leading mediaeval authority up to the time of Saliceto. He in his turn was deeply indebted to Paulus Aeginetus (625–690), whose sixth book was the foundation on which Albucasim built up his own treatise. He is said to be the first medical man ever to write about the treatment of deformities of the mouth and dental system; and Dr. Herbert Spencer quotes him as having anticipated Walcher in the discovery of the obstetric posture now known by the latter's name.

The other treatises look as if they are all by the same scribe as is the *De Chirurgia*, though the quality of the ink and of the vellum seems to vary somewhat. That next after Albucasim's work is the *Chirurgia Rogeri*, composed about 1170, and re-edited by his pupil Roland about 1230–40—that is, quite shortly before the probable date of the Penzance manuscript. Ruggiero Frugardi Roger was a surgeon of Palermo, and Roland came from Parma; they were among the earliest teachers in Europe to free themselves from excessive dependence upon Arabian sources. Roger described cancer and (possibly) syphilis; ordered seaweed ashes (iodine) for goitre and scrofula; used mercurial inunctions for chronic parasitic infections; performed suture of the intestines over a hollow tube; used sutures, styptics, and ligatures for haemorrhage; and described the healing of wounds by second intention.

Then follow six leaves concerning equine surgery, and lastly there are three treatises devoted apparently to obstetrics and gynaecology, entitled respectively "De passionibus mulierum," "Liber sanitatis salernitanae de passionibus mulierum," and "Hippocras de passionibus

mulierum." These are all comparatively brief compendia, and they do not receive the artistic care in respect of initial letter illustrations, etc., that is devoted to the first two parts of the volume. It may be contended that, if this really is the oldest extant medical textbook written in England, the proper place for it is the library of the British Museum; but if the Trustees are not interested (or have not enough money to come into the market for it), it is to be hoped that the MS. may be acquired for some medical library, and the Library of the Royal College of Surgeons of England naturally occurs to mind as a fitting home.

MUSIC AND MEDICINE

Ever since primitive man with the aid of incantations and dances sought to cast forth the possessive spirits of the sick, music has played an erratic part in the treatment of disease. In Hindoo mythology Patragali, the small-pox goddess, is frequently depicted being invoked with music played on drums. The priest-physicians of ancient Egypt had a favourite incantation for promoting fertility in women, while Theophrastus, pupil and friend of Aristotle, used music to cure the bites of serpents. Pythagoras's advocacy of the healing force of music in the treatment of insanity recalls the successful response of Saul's mental attacks to David's harp. In the case of George II of England music was able to prevent as well as relieve fits of melancholy. At an evening of music and medicine, held in New York City on January 23 under the auspices of the Innominate Club and of the Juilliard School of Music, Dr. Victor Robinson presided over an interesting programme, which included the following selections: music of the American Red Indian medicine men; Tom o' Bedlam Song (1666); hymns in praise of St. Sebastian, patron saint against the plague (1702); dance music played in the treatment of tarantism (1641); a frottola used in the relief of syphilis in Mantua (1517); and Richard Strauss's "Death and Transfiguration." Dr. Gregory Zilboorg gave a critical survey of the psychological aspects of the use of music in therapeutics, and Dr. W. R. Bett, discussing the historical relations between music and medicine, reminded the audience that Apollo was the god of music as well as the father of Aesculapius, upon whom he bestowed the gift of healing. The Russian composer Alexander Borodin began his career as a medical practitioner; Albert Schweizer, the world's foremost exponent of Bach's organ music, is a medical missionary on the West Coast of French Equatorial Africa; and Fritz Kreisler at one time was a medical student, but never qualified.

MEMORIALS OF HERMAN BOERHAAVE

On September 23, 1738, Herman Boerhaave, the Dutch Hippocrates, died at Leyden, and on September 23 and 24, 1938, tributes were paid at Leyden and at Harderwijk, where in 1693 he graduated, by sixteen speakers from various countries. These contributions have now been translated into English, French, or German, and collected into a volume[1] with illustrations dealing with his life, such as his birthplace, the hospital of St. Cécile where he taught medicine at the bedside, and his tomb. The orations include two dealing with him as botanist, others on him as a chemist, as a clinician, a teacher, and on the influence of his *Institutiones Medicae* on modern physiology. Professor John Fulton of Yale speaks of this book as the earliest textbook of physiology intended primarily for medical students. Dr. J. D. Comrie shows how much Edinburgh medicine owed to Boerhaave, and also points out that Boerhaave was in 1692 a pupil of the Edinburgh physician Alexander Pitcairne, who was then professor of physic at Leyden. Professor H. E. Sigerist of the Johns Hopkins University describes Boerhaave's influence upon American medicine, and Professor K. F. Wenckebach his importance, through his pupil van Swieten, in Viennese medicine.

[1] *Memorialia Herman Boerhaave. Optimi Medici.* (Pp. 133; illustrated. Frontispiece. Hfl. 1.90.) Haarlem: De Erven F. Bohn, N.V.

MALIGNANT MELANOMA

PROFESSOR GREY TURNER'S ORATION

The sixth Prosser White Oration, delivered under the auspices of St. John's Hospital Dermatological Society, was given by Professor GREY TURNER on June 28, Dr. R. T. BRAIN presiding.

Professor Grey Turner said that it was a great compliment for a surgeon with general interests to be asked to address a society concerned with a special branch of medicine. Forty-one years ago he saw the case which first aroused his interest in this condition—a boy with a melanotic growth on the back and a large mass of glands in the axilla. He described briefly a number of cases of which in the intervening years he had had experience; they made a disconnected, but usually tragic, story.

One case, for example, was that of a man aged 45 who for eight years had had a black patch on the back, just below the angle of the scapula on the right side. It began to grow rapidly, and, two months before he himself saw the patient, was removed by his medical man. He was then discovered to have a melanotic tumour and a large mass of glands in the right axilla. The tumour was removed, with a reasonable amount of skin, and the glands dissected out. A month later the black patch had recurred, there was a nodule at a little distance, and a mass of glands in the left axilla. Again the patch and the glands were removed, but in a very short time another nodule appeared and grew rapidly, enlarging in a few days from the size of a sixpence to that of a shilling. The patient died within seven months of the first interference with his melanotic growth.

One recent case was that of a darkly pigmented woman who had a black patch in the right iliac fossa. The patch became large, irritable, and ulcerated. There were no palpable glands, and, unfortunately, only a local excision was undertaken. Two years later a large mass appeared in the region of the right axilla, but the woman being a long way from a town nothing was done until later; death took place three years after the first operation. In another case, in a woman, there were glands in both groins, but the patient, who lived in a remote part of England, would not have anything done beyond removal of the local mass. There was recurrence, and again removal, followed by general dissemination, from which death occurred ten months later. In the most tragic case of all death took place just four months from the time that an inconspicuous mole began to exhibit active changes and was locally removed.

Sometimes the primary focus was not only very small but remained inconspicuous to the end of the chapter, occasionally even being overlooked so far as the patient was concerned. The glands sometimes showed very little pigment indeed. Occasionally a patient came under one's notice who was not suffering from any local lesion, but from general ill-health, and it was ultimately discovered that some small and almost forgotten primary melanoma, probably malignant, had been removed. Another case which Professor Turner described was that of a woman admitted to hospital almost in a comatose condition. For some two or three months she had been suffering from cerebral symptoms, but it was not thought that any useful purpose would be served by opening the skull. It was discovered that she had had a small growth removed from the back; there had been no obvious recurrence or other growth, but at the post-mortem examination she was found to have melanotic nodules throughout the brain.

Forms of Melanotic Growth

The forms of melanotic growth varied a good deal. The lecturer showed an illustration of a large papillomatous type of tumour growing from the skin over the breast in a woman of 29. This type was rather less likely to be of the malignant character than the flatter growths

which invaded the underlying parts of the skin at an earlier stage. It explained some of the cases which were more readily cured by what would ordinarily be looked upon as ineffective methods of treatment. He also drew attention to the pedunculated type of melanoma with a cherry-like lump—a particularly dangerous type if for no other reason than that it was so easy to assume its innocuousness and to remove it by an encircling ligature. In passing, the lecturer paid a tribute to Sir Jonathan Hutchinson's teachings in dermatology, and particularly his insistence on the possibly dangerous nature of moles. He had drawn attention especially to itching, which was often the first feature of which the patient was conscious of some impending change in a long-standing mole. The thickening or extension of a black patch, in addition to the more obvious tendency to break on the surface and to bleed, should be looked upon as significant and as suggesting that the condition had already become malignant.

The story of treatment was on the whole a melancholy one. Case after case was on record in which only local measures had been taken, with tragic results. In seeking enlightenment with regard to a rational basis of treatment it was worth referring to the excellent Hunterian Lectures which Mr. Sampson Handley published more than thirty years ago. One of the illustrations from his work, reproduced by the lecturer, showed the spread of a malignant melanoma by radical lymphatic permeation, which suggested the adoption of operative treatment by radical local removal of the tumour together with the lymphatic path of probable malignant invasion. He went on to refer to the outstanding work of Hogarth Pringle of Glasgow. In 1898 Pringle operated on a patient with melanotic sarcoma and deposits in the axilla. A very thorough operation was carried out along these lines, and thirty-eight years afterwards the patient was alive and well, with no recurrence, despite the fact that she was then the mother of three children. He mentioned that because it was fairly well known that pregnancy was supposed to encourage the recurrence of malignant tumours. Pringle had another similar case, a young man of 30, who was known to be well over thirty-one years later. The lecturer had heard recently of a further case operated upon by Professor Archibald Young, which was equally encouraging: a man of 45 who had melanoma on the dorsum of the foot and was alive and well eighteen and a half years afterwards. This demonstrated that the systematic operation gave in some cases a chance of curing the condition. Professor Turner described two cases in which he himself had had the opportunity of carrying out a reasonable operation. In one case the patient was alive and well four years after the operation. The second case was quite recent—a woman of 66 with a melanotic growth on the palm of the hand and enlargement of the epitrochlear gland. The primary growth with a wide area of healthy tissue, a strip of skin to above the elbow, the lymphatic vessels together with a wide strip of deep fascia, and both the epitrochlear and axillary glands were all removed *en bloc* and at one sitting. He described the operation in detail, emphasizing the extreme importance of thorough clearance of the fascia. The textbooks were rather half-hearted about it. They usually referred to the removal of the glands but said nothing about the importance of the removal of the intervening lymphatics. In fact, there was nothing to give the student any idea of the sort of radical operation which was essential if success was to be achieved.

After a discussion of the special problems of melanoma in particular situations, such as the extremities, the cheek, the neck, and about the genitalia, he touched on alternative methods of treatment. He said that he could not speak with any great experience or authority, but his observations made him doubt very much the value of irradiation in melanotic growths. As to the management of moles, if local moles were single and accessible they were very much better removed. Multiple small moles were best left alone, but patients should be warned that if the slightest change was noticed they should at once seek advice. The several problems connected with melanoma of the ocular region were also considered. He concluded with the remark that malignant melanoma should not be regarded as hopeless from the point of view that there was nothing to be done or that it did not matter what was done. Rather should they be regarded from the point of view of aggressive and thorough surgical excision of a large area of skin and deep fascia and the whole of the corresponding lymphatic areas.

MATERNITY AND CHILD WELFARE

NATIONAL CONFERENCE

Delegates from local authorities and social welfare organizations from all parts of the country attended the National Conference on Maternity and Child Welfare, which took place at the British Medical Association House, London, from June 27 to 29. The general subject of discussion was "The Problems of Parenthood," and each of the six sessions was under the auspices of one or more of the constituent bodies of the National Council. A child welfare exhibition was held in the Hastings Hall, and films were shown three times daily.

The Minister of Health

Dr. WALTER ELLIOT, Minister of Health, in opening the conference, pointed with pride to the recent figures of maternal mortality. If in 1938 women had died in childbirth at the same rate as they had done only four years previously 930 more mothers would have lost their lives; or, to put it in another way, the weekly toll of deaths in 1938, which was thirty-seven, would have been fifty-five if the rate of mortality prevailing in 1934 had continued undiminished. No doubt many forces had co-operated to bring about the result. One was the extended provision of ante-natal supervision, including medical examinations, as a routine measure. The number of expectant mothers attending ante-natal clinics was more than half as many again in 1938 as it had been in 1934. Another factor was the improved and organized domiciliary service of salaried midwives operated by local supervising authorities. Again, there had recently been a marked increase in the provision made by maternity and child welfare authorities for the supply of free or cheap milk. Advances in technique had assisted doctors and midwives; a striking illustration was the use of prontosil and allied substances in the treatment of puerperal sepsis. Dr. Elliot also referred to the report of the Committee on Abortion, which, he said, should be of the utmost help in affording guidance as to the best course to pursue.

Safety in Childbirth

The first discussion, organized by the Maternity and Child Welfare Group of the Society of Medical Officers of Health, was on "Safety in Childbirth for Mother and Child." Dr. GERTRUDE DEARNLEY (Queen Charlotte's) described the conditions which obtained in the ideal ante-natal clinic. The atmosphere should be calm and reassuring; it was easy to forget the extreme apprehension and doubt often present in the mind of the young prospective mother. Centres must not be conducted as if they were out-patient departments; two aspects of the work had to be reconciled: to treat the mothers as normal and to make them come regularly. If the doctor who had the confidence of the patient could carry out the confinement it was of great help in preserving the mother's morale. A number of complications arising in labour were due to a nervous factor, and if labour began with the patient in a state of fear and apprehension its course was often disadvantageously affected. She expressed the hope, amid applause, that all confinements would eventually take place in well-equipped maternity hospitals.

Dr. C. K. J. HAMILTON (Charing Cross Hospital) spoke of the premature infant, suggesting that nothing better could be done than to follow the three guiding principles laid down by Professor Pierre Budin many years ago: keep the infants warm, feed them on breast milk, keep them away from all possible infection. The premature infant differed from the full-term one in several important respects. His whole existence was much more vegetative, the mechanisms controlling swallowing and sucking were poorly developed, as were the brain centres which controlled breathing.

In some general discussion a Cardiff delegate said that of eighteen mothers attending the ante-natal centres in that city last year, about half were found to be suffering from some abnormality. A Shoreditch delegate mentioned that in her borough, notwithstanding its poverty, there was no maternal death in 1937 and only one in 1938—a woman who had not attended the ante-natal clinic. Two speakers pleaded for the abolition of the block grant, the imposition of which prevented desirable extensions of welfare work. A delegate from Fletton mentioned an unusual problem at her clinic—namely, a falling off in attendance traceable to the working of the new Midwives Act. An Enfield delegate urged that the Press should be persuaded to treat maternal mortality in a less sensational way; a good deal of damage was done by certain kinds of newspaper reports.

Breast-feeding

Dr. J. C. SPENCE (Newcastle-upon-Tyne) opened a discussion on this subject. He started by assuming that women should breast-feed their babies until the sixth month, and that at least 95 per cent. of them were capable of doing it. In a maternity hospital in Newcastle the figures for the most recent year showed that 74.6 per cent. of the babies were wholly breast-fed on leaving the hospital at the age of 10 to 14 days, but there had been a progressive fall in this figure during the last four years. Some would explain and justify this decline on the grounds that modern knowledge had made artificial feeding safe and satisfactory. When this was not openly stated it was suggested by certain patent food and dried milk advertisements. There were reasons other than the immediate welfare of the baby which made breast-feeding desirable and necessary. One was the beneficial effect on the physical and psychological health of the mother. Gestation, birth, and lactation formed a reproductive cycle which was broken abruptly if the woman failed to suckle her infant, and one result might be a decrease in reproductive capacity as one generation of non-lactating women followed another. It was necessary to arouse the interest of doctors and maternity nurses in this subject. The family doctor was the most powerful instrument of health propaganda available.

"He does not spend his time defending citadels, as some might suppose, and I have always found him ready to lend his aid to any measure of preventive medicine."

But he worked under two great handicaps. He had too little experience in the welfare and diseases of infants, and in his practice he had less and less opportunity in this work, because it was passing from him to the clinics.

"Welfare centres and health centres will never have as much propagandist influence as family doctors trained and interested in infant welfare, and the untrained and uninterested family doctor will neutralize the influence of welfare centres."

Dr. HAROLD WALLER discussed the various factors which normally govern the outflow of milk and the possible causes of engorgement, with ways and means for its prevention and relief. He pleaded that the rules governing the feeding of the newborn must take more account of the requirements of the breast if the secretion of milk was to be maintained, and be less subordinated to such matters as strict punctuality and institutional routine. Miss M. LIDDIARD (Mothercraft Training Society) said that the midwife doing private maternity nursing was able as a rule to interest her patient in breast-feeding. Some of the nurses in private maternity work after training with her society had not encountered an artificially fed baby since their training.

The last of the principal speakers in the discussion was "an ordinary plain mother" whose experience of breast-feeding had been a little unusual. Having failed, for various reasons, to nurse her first four babies, she determined, at 40 years of age, to nurse her fifth, and, after some initial difficulty, at the end of sixteen weeks she accomplished it, and repeated the performance even more successfully with her sixth. Two speakers in the general discussion, one of them Dr. BREWER (medical officer of health for Swindon), declared that the result of so much encouragement to breast-feed was having the opposite effect; it should be taken for granted that babies would be breast-fed, and the breasts should be left alone. A breast pump, said Dr. Brewer, should never be used, for it did not empty the breasts; he thought it tended to destroy them. At the close of the session Sister BIRCHALL gave a demonstration of the method of collecting and preserving human milk at Queen Charlotte's, an account of which was given in our issue of June 24 (p. 1298).

Nursery Schools and Foster-mothers

In a discussion on nursery schools Dr. MARGUERITE HUGHES (Bristol) mentioned that the average net cost per child per annum in a day nursery was £20, as against £70 in a special school for the defective and £130 in a children's hospital. Dr. J. L. BURN (medical officer of health for Barnsley) expressed dissatisfaction at the present system of care of the toddler. More treatment and day-by-day supervision was needed, and this could only be done by nursery school work, not by an occasional "come up" at the clinic. At the end of a rather animated debate a resolution was passed:

"That in view of the proved efficiency of day nurseries and nursery schools in promoting healthy physical and mental development in early childhood, this conference urges that nothing should be allowed to interfere with the maintenance and extension of these services for children under school age."

Dr. P. V. PRITCHARD (deputy medical officer of health for St. Pancras) said that he was convinced that many foster children were brought up in most unsuitable surroundings by unsatisfactory foster-mothers. The position could be improved by legislation which would give the supervising authority more control over foster-parents and foster-homes. He urged that the foster-mother should be required to obtain a licence periodically renewable subject to a satisfactory record. Miss M. I. FOSTER described the Birmingham Foster-mother Service, inaugurated in 1935, which had been the means of bringing about a marked improvement in the type of homes offered and the standard of care given.

The problem of the parent with a physically defective child was the subject of another discussion. Miss G. A. Hansell gave an intimate picture of the way in which such parents met their responsibilities, discharging them sometimes with success and sometimes with slackness, even in the same family. Dr. GRACE CALVER (Tavistock Clinic) pointed out the frequent psychological difficulty, often met with in the case of the parent of the normal child, but exacerbated in the parent of the defective, that the father and mother did not see the child as an individual, but only as a reflection of themselves. Mrs. J. E. Thomas paid a tribute to the many mothers who bore this burden with praiseworthy patience and self-sacrifice, and the last speaker of all was the mother of an invalid child, who thanked the Invalid Children's Aid Association for the help it had given.

The final session was on propaganda in maternity and child welfare work, and was addressed by Dr. G. H. GEFFEN and others. A feature of the conference was a short postgraduate course (two days) for medical members, arranged by the Maternity and Child Welfare Group of the Society of Medical Officers of Health.

Reports of Societies

SULPHANILAMIDE IN TROPICAL DISEASE

At the thirty-second annual general meeting of the Royal Society of Tropical Medicine and Hygiene on June 15, with the new president, Sir RICKARD CHRISTOPHERS, F.R.S., in the chair, Dr. G. A. H. BUTTLE read a paper on the action of sulphanilamide and its derivatives, with special reference to tropical diseases.

Dr. Buttle said that the discovery of the effect of prontosil by Domagk marked a new era in the treatment of bacterial disease. Later, in the same year, Trefouel and his colleagues found that sulphanilamide, a simpler substance than the original prontosil, was just as effective, and during the last four years a large number of compounds of sulphanilamide had been made. Compounds in which substituents were introduced into the amino group of sulphanilamide included the original prontosil (now called prontosil rubrum), prontosil soluble, rubiazol, proseptasine, and soluseptasine; they probably owed their activity to the liberation of sulphanilamide in the body, and they were not more active than sulphanilamide itself. The soluble derivatives for parenteral injection were indicated only when treatment by mouth was impossible, and if treatment by this route had to be used exclusively large doses were required—for example, 60 to 120 c.cm. daily. Compounds in which substituents were introduced into the amide group of sulphanilamide, on the other hand, were probably not broken down in the body, and one of those—M & B 693—had a wider range of activity than sulphanilamide itself. It was much more effective in pneumococcal infections and slightly more effective in staphylococcal and gonococcal infections. Uleron and albucid, two other compounds of this class, had been used in gonococcal infections.

Many tropical diseases had been found to be benefited by these drugs. Elephantoid fever with its accompanying lymphangitis was rapidly controlled owing to the action of the drugs on the secondary streptococcal infection. In malaria *P. knowlesi* infections of monkeys were rapidly cured, but *P. relictum* in birds and *P. falciparum*, *P. vivax*, and *P. malariae* infections in man were much less susceptible. The drugs, however, appeared to act as a true causal prophylactic in *P. falciparum* infection in man, and if patients were treated at the time of the mosquito bites infections did not occur. Those were the only known drugs to do this.

Cases of pneumonia were improved in a remarkable way by M & B 693, and meningococcal meningitis responded well to both sulphanilamide and M & B 693. In typhoid fever some effect might be expected in the first week of the disease, but the benefit of drug treatment in the later stages was much more doubtful. In *Br. abortus* and *Br. melitensis* infections good results were reported, but they were perhaps not so striking as those in streptococcal, meningococcal, and pneumococcal conditions. In plague, experiments with M & B 693 had given remarkable results, but to date there was very little published work on its therapeutic action in bubonic plague in man.

The only virus conditions directly influenced were lymphogranuloma and trachoma; clinical reports on these conditions indicated that in the former the treatment was effective, while in the latter the corneal condition was improved much more than the conjunctival. In small-pox the drugs prevented the pustulation which was responsible for most of the trouble. Administration of the drugs orally or subcutaneously enabled the blood to kill large numbers of streptococci. If sulphanilamide was added to shed blood streptococci grew at the same rate in the sulphanilamide specimens as in the controls for the first two hours, but subsequently the streptococcal population in the sulphanilamide specimens decreased until the blood became sterile, while in the controls the organisms went on multiplying. The mode of action of the drugs on the bacteria was still undecided.

General Discussion

Colonel J. A. SINTON said his experience of the sulphanilamide compounds was limited to experiments with cases of induced malaria. Reports on these drugs were somewhat contradictory. In man they had not proved as effective in the clinical treatment of malaria as the cinchona alkaloids and atebrin. Proseptasine had proved of little value in the treatment of induced infections in man with the Madagascar strain of *P. vivax*, while in infections with the Rumanian strain of *P. falciparum*, though the febrile attack was cut short, he had found that relapses tended to occur after a very short interval. In a recent case of mixed infections with *P. ovale* and *P. malariae* a continued dosage of 6 grammes of proseptasine (1 gramme every four hours) had failed to eliminate either species of parasite from the peripheral blood during the course of ten days' treatment. Ten grains of quinine rapidly led to a fall in the temperature and disappearance of the parasites. On the other hand, Coggeshall and Chopra had both reported that those compounds had a remarkably radical curative action in rhesus monkeys experimentally infected by blood inoculation with *P. knowlesi*. This constituted another example of the well-recognized fact that anti-malarial drugs might have a selective specific action which might be restricted not only to different stages in the parasitic cycle but also to different species, and possibly even to different strains of the malarial parasite. In the past the only drug known to exert a true prophylactic action was plasmoquine, which James had shown to be effective against some strains of *P. falciparum*. Unfortunately the doses required were too large to be of use in practice. At Horton they had recently found that proseptasine in non-toxic doses also appeared to exert a similar prophylactic effect upon the Rumanian strain of *P. falciparum*. The ultimate solution of the malarial problem might prove to be the discovery of a drug which had a true, causal prophylactic action and whose use proved practicable upon a world-wide scale.

Dr. P. MANSON-BAHR said that the problem now was no longer when to administer the sulphanilamides, but when not to do so. He had been very impressed with the results obtained by these compounds in pneumonia, genito-urinary infections in tropical patients, tonsillitis, sinusitis, and middle-ear trouble, but in lymphogranuloma inguinale and certain chronic ulcerations they were not so satisfactory. Thus, in two cases of tropical ulcers and in one case of ulcerating granuloma of the pudenda there was no effect. Two seamen from the Tropics, whom he had diagnosed on clinical grounds as cases of infective endocarditis, responded in dramatic fashion to intravenous prontosil soluble therapy. In abortus fever, prontosil and soluseptasine shortened the duration of fever, but relapses occurred. Dr. DYCE SHARP remarked that in West Africa he had seen miraculous results in puerperal septicaemia as well as in tetanus. His last five consecutive cases of tetanus had recovered after treatment with drugs of the sulphonamide group. When the patients could swallow he had given the drug by the mouth; otherwise it was injected intramuscularly every four hours. Dr. R. LEWTHWAITE referred to tsutsugamushi disease (Japanese river fever), which was a mite-borne infection with *Rickettsia orientalis*. The results in experimentally infected guinea-pigs in Malaya obtained by Dr. S. R. Savoor and himself showed that in twenty-seven guinea-pigs treated during the incubation period with different drugs of the sulphonamide group all contracted the disease, and that in twenty-five out of twenty-seven animals it was of usual severity. In animals treated after the onset of the disease the results to date indicated therapeutic failure.

Dr. N. HAMILTON FAIRLEY said the most common complication of tropical sprue was *B. coli* infection of the

genito-urinary tract, and here prontosil and proseptasine were equally efficacious in clearing up the infection. As a rule sprue patients were intolerant of drugs, but fortunately they stood this treatment well. In the presence of urinary infections sustained blood regeneration was more difficult to establish and a larger dosage of liver extract was often required; for this reason alone *B. coli* infections should be eradicated as soon as possible. Recently in Macedonia he had an opportunity of introducing M & B 693 to the staff of the refugee hospital at Thessalonica, where the Greek physicians had not previously heard of the valuable action of the drug in pneumonia, meningitis, or gonorrhoea. In Macedonia pneumonia was a particularly fatal complication in patients with chronic malarial cachexia, and M & B 693, when it became available, was bound to decrease markedly the mortality from that cause.

Dr. A. FELIX emphasized that in typhoid fever the results with sulphanilamide therapy had proved disappointing, and that in some cases there had been a definitely harmful effect. This might possibly be due to the leucopenia which ordinarily accompanied typhoid being increased by drug action.

Dr. BUTTLE in reply said that his results in animals with tetanus treated by the mouth had not been very encouraging. His impression was that M & B 693 was a little more effective than sulphanilamide. Meyer stated that in mice infected with tetanus spores he had cured 80 per cent. That might depend on a difference in the strains used, as had proved to be the case with pneumococci.

A meeting of the North of England Obstetrical and Gynaecological Society was held in Newcastle-upon-Tyne on May 10. The president, Professor E. FARQUHAR MURRAY (Newcastle), delivered his presidential address entitled "Retrospect, Introspect, and Prospect." The address was devoted to the changes in gynaecological practice which had taken place since 1911. Dr. K. V. BAILEY (Manchester) read a paper, illustrated by a colour film, on "A Modification of the Fothergill Operation." Mr. FRANK STABLER (Newcastle) showed a child in whom precocious puberty had been due to a granulosa-cell tumour and a girl who had been cured of masculinization changes by the removal of a small ovarian arrhenoblastoma. Mr. PERCY MALPAS (Liverpool) read a note on "The Early Foetal Blood Picture."

Local News

ENGLAND AND WALES

Emergency Medical Services: New Appointments

With a view to strengthening and co-ordinating the emergency medical services, Dr. Walter Elliot, Minister of Health, and Sir John Anderson, Lord Privy Seal, have appointed Dr. J. H. Hebb, Director-General of Medical Services in the Ministry of Pensions, who is already acting as a Principal Medical Officer in the Ministry of Health, to take charge, as Director-General, of Emergency Medical Services both in the Ministry and in the Air Raid Precautions Department of the Home Office. Dr. Hebb will be assisted by a deputy, Lieutenant-Colonel E. T. Potts, who will act as headquarters officer in relation to medical personnel, assisted as regards nurses by Miss Watt, late matron-in-chief of the R.A.F., who will also be associated with the Central Emergency Committee of Nursing, the body responsible for building up the Civil Nursing Reserve. Additional hospital officers have also been appointed as follows: Dr. P. H. Oakley (Headquarters); Colonel T. H. Scott and Wing Commander A. J. Brown (London Region); Dr. A. E. Tudor Hart (Midland Region, centred in Birmingham); Lieutenant-Colonel C. L. Dunn (North-Western Region, centred in Manchester); Colonel H. T. Bates (North-Eastern Region, centred in Newcastle). Colonel Bates's appointment is vice Dr. Donaldson, who has been promoted in the Ministry. Lieutenant-Colonel Potts had wide organizing and administrative experience as Assistant Director of Medical Services at the headquarters of the British troops in France and Flanders (1919–20), and as Assistant Director of Medical Services, General Headquarters of the Army in India, 1928–33.

Hospitals in War Time: Minister's Statement

The Minister of Health, at a conference with the chairmen of the principal London teaching hospitals on July 4, said that he had invited them to meet him in order to discuss with them the organization, personnel, and equipment of hospitals in time of war. It was clear from correspondence in the Press and a recent debate in the House of Lords that certain important questions were still pre-occupying the voluntary hospital authorities in London. The criticisms fell into two groups, the first relating to material and the second to finance.

As to material, the present position was as follows. In emergency 100,000 existing hospital beds in England and Wales not only could but would be immediately cleared and made available. The additional beds to be introduced into hospitals had been manufactured and were on hand. The works of adaptation necessary for upgrading had been settled at almost all the hospitals involved and, in the majority of cases, authority given to the hospitals to carry out the works at once, mainly if not entirely at the Government's expense. At many of the hospitals these works were in process of completion, and the Ministry was arranging very shortly a "follow-up" to see what progress had been made. Over 40,000 additional hospital beds were being provided in hutments in England and Wales, and the first huts to be erected would be completed at the Wellhouse Hospital in Hertfordshire before the end of this month. Fifty hutting schemes should be completed during the course of the summer. Approximately 100 hutting schemes had been settled in all, and only a shortage of labour—which everything possible was being done to avoid—would prevent the completion of the whole of these schemes this year. Group officers appointed by the voluntary hospitals themselves had been at work in the London sectors for four months on the distribution among the expanding hospitals of the available medical personnel, and had, in fact, worked this out for all the doctors in their sectors. Auxiliary nurses were being steadily recruited and trained, the number so far being 60,000.

It had been suggested that the financial resources were inadequate. So far as could be estimated the Department was already committed to peace-time expenditure of nearly £8,000,000 on the emergency hospital scheme. They were most anxious to receive any constructive proposals which would result in improvement or acceleration of the scheme. Proposals on the finance of the treatment of casualties in war time had been submitted to the hospitals. These were that flat-rate payments per casualty should be made, to be regarded as interim payments, and subject to adjustment as soon as a review could be made of the effect on the financial position of the hospitals of providing a casualty service. In addition, if any hospital were so financially embarrassed that it could not provide the casualty service required of it the Government would provide such financial accommodation as might be necessary. These proposals were in the hands of the hospitals, and the Ministry was awaiting their reply.

A considerable administrative organization had been brought into being in the Ministry to deal with these questions. It was clear, however, that many of those closely concerned considered that further administrative effort was necessary. For that reason he had desired to bring together those who took that view and the officers of the Department, and he suggested

that when the points they wished to raise had been discussed they might consider how far they could be cleared up forthwith.

It was agreed that the chairmen of the hospitals would draw up a detailed memorandum on the points on which they would like to have guidance or decisions, and that after that memorandum had been submitted to the Minister they would, if he so desired, meet him again.

Guild of Hospital Librarians

At the fifth annual meeting of the British Section of the International Guild of Hospital Librarians the chairman, the Marquess of Hamilton, congratulated members on the splendid work achieved during the year. He said that the Hospital Library Service in London was now nearly complete, but that the International Conference to be held in London next year would be a formidable test, as many librarians from abroad would be visiting hospital libraries in England. Lord Hamilton spoke also of the shortage of librarians; he realized this was mainly due to national service, but hospital librarianship was also of great importance and must continue. Mr. Harold Raymond, speaking on "The Librarian," said the work seemed to him so splendid that he was amazed to hear of the shortage of librarians. Hospital librarians were not only helping sick people to while away dreary hours but they were also doing a permanent work in helping many who had never before had the benefits of books and leisure to appreciate the advantages of reading. Miss Blyde, sister matron of King's College Hospital, told how greatly the library service was appreciated by patients, and spoke of its value from the nurses' point of view. She emphasized also the importance of personal contact with someone from outside who would show an interest in themselves and their homes. Hospital librarianship meant so much more than merely giving out books.

SCOTLAND

Edinburgh Summer Graduation

At the summer graduation of Edinburgh University for divinity, law, and arts, Principal Sir Thomas Holland conferred the honorary degree of LL.D. upon eight graduates. These included John Clarence Webster, M.D., F.R.C.P.Ed., formerly professor of obstetrics and gynaecology in the Rush Medical College of the University of Chicago. The Dean of the Faculty of Law, in presenting Dr. Webster for the degree, said that he had come fifty-six years ago from his native province of New Brunswick to start his medical course in the University of Edinburgh. After twelve years of study, teaching, and research in Edinburgh he had returned to Canada as a lecturer in McGill University, and in 1899 had been appointed to the chair of obstetrics and gynaecology in the Rush Medical College, and had practised in Chicago for twenty years. On his retirement to New Brunswick in 1919 he had done invaluable work in restoring and preserving the archives, historic sites, and monuments in the maritime provinces of Canada.

Physical Fitness at Edinburgh University

Edinburgh University is the first in Great Britain to establish a course of physical training for students while studying for academic degrees, which will be recognized by the granting of a certificate of physical ability signed by the principal. This scheme was recently approved by the Senate of the University, is open to matriculated students, and is entirely voluntary. To obtain the certificate of physical proficiency students must attend not less than thirty meetings of physical training classes in two consecutive sessions, and then pass a test examination. At present about 20 per cent. of the men students at the University are taking this voluntary course, and it is anticipated that a similar scheme will be introduced for women at an early date. This movement goes back to 1926, when the University Court set up a special committee to consider the whole question of facilities for students' athletics. The chief recommendation of that committee was that a director of physical training should be appointed to organize and develop athletic activities and general physical culture among the students. Colonel Ronald Campbell was appointed director, and a university gymnasium was established in Minto House, which has been in constant use since then. The scheme for assessing physical ability is to be based on tests already carried out successfully by the Army, and includes tests for agility, strength, and dexterity. The principle is urged that games should be carried out in the spirit of play and mental recreation if most is to be gained from them, and that over-specialization is a menace to sport. It is also held to be a mistake to place games in charge of officials, for when much depends upon teams winning the spirit of play vanishes and the value of games is lessened. Week-end camps for fishing, climbing, and other outdoor recreations are also recommended. It may be added that the Edinburgh University Physical Training Department has not only been largely successful among students but has been recognized by the National Fitness Council, has given assistance to other bodies such as the Industrial Welfare Society, and has provided courses for instructors from the factories of Imperial Chemical Industries.

Royal Blind Asylum

Sir William M'Kechnie, speaking at the annual meeting of the Royal Blind Asylum and School in Edinburgh on June 22, said that some fifteen years ago the number of blind children in schools of Scotland was about 300. Ten years ago it was 320, but now it was only about 200. He believed that this diminution was mainly due to the treatment of ophthalmia in the newly born, but children who were blind through inadequate treatment as infants were still being received from certain parts of the country. By the Act of 1936 blind children should be provided for in schools for the blind from the age of 3 to 18, and education authorities of Scotland should see to it that these children had the benefit of the admirable facilities afforded by such schools.

Health of Dunfermline

The maternal mortality for the burgh of Dunfermline during 1938 was *nil*, a result never before achieved in the history of the burgh. This statement is contained in the annual report of Dr. C. Barclay Reekie, medical officer of health for Dunfermline. Infant mortality for the year was sixty-two per 1,000 births, as compared with the rate for Scotland of seventy. A scheme for the attendance of women under the Maternity Services (Scotland) Act, 1937, was introduced and was accepted by practitioners on the understanding that there would be an opportunity for review of the terms at the end of one year. The municipality manages a maternity hospital in which 638 cases were treated during 1938, an increase of 164 on the previous year. The Carnegie Dunfermline Trust has established a remedial clinic for orthopaedic treatment at which there were 137 new cases during the year, the total attendances being 4,135. Eighteen patients requiring hospital treatment were transported to the Princess Margaret Rose Hospital for Crippled Children, Edinburgh. The burgh's requirements in personnel for its air raid precautions casualty service are 260 men and 530 women, and at the end of the year 130 men and 232 women had volunteered. It is suggested that a solution of the problem of securing personnel would be the formation of an air raid casualty corps similar to the Territorial units of the R.A.M.C., with uniform, rank, and discipline, and equivalent rates of pay for both men and women.

Correspondence

Presentation to Professor R. E. Kelly

SIR,—A committee has been formed consisting of representatives of the Royal Infirmary, the Liverpool teaching hospitals, the University, and of his old surgical registrars and house-surgeons, to collect funds for the purpose, first, of presenting Professor R. E. Kelly, C.B., with his portrait, and, secondly, of perpetuating his name in association with the teaching of or research in surgery at the University. The appeal is being circulated to members of the above institutions, but it was felt that other medical men who could not be reached in this way might like to associate themselves with the presentation. Subscriptions should be made payable to the University of Liverpool, and should be sent to the finance officer at the University.—I am, etc.,

HUGH REID,
Secretary to the Committee.

Liverpool, June 28.

Splints for Fractured Femur

SIR,—Mr. Max Page (*Journal*, June 17, p. 1255), and, in a private communication, Mr. Watson-Jones, have protested against my statements that the Braun splint has supplanted the Thomas and Hodgen splints for the treatment of fractured femurs under skeletal traction, and that the traction is best applied through the femoral condyles. Will you allow me to amplify somewhat, and also to correct, the too bald and dogmatic statements of which I was guilty?

First with regard to the splints. The Thomas splint was designed for fixed traction, and was always so used by Robert Jones, who opposed its use with free (weight) traction. If this splint, unsurpassed and probably unsurpassable in its original simple form for fixed traction—that is, nowadays for transport—is converted in its "bent" form to a mere supporting framework for the limb, with its distal end resting on a Balkan beam, it is simply doing the job of a Braun splint less efficiently, with a ring serving no useful purpose and very much in the way for nursing. I therefore assume that Mr. Page refers to the Thomas splint suspended freely, like a Hodgen. In this case I can only suggest that the two methods be carefully compared in practice, with surgeons and, not less important, house-surgeons and nurses used to and advocates of each method. I believe such an inquiry would bring conversion. I would especially emphasize that the Braun splint, while not foolproof, requires definitely less nursing attention.

Mr. Watson-Jones will, I am sure, allow me to quote from his private letter. "I am confident that the Thomas splint is equally as effective as the Böhler-Braun splint for most fractures of the shaft of the femur, and that it is very much more effective and more safe than the Braun splint for fractures high in the shaft of the femur." The fractures of the upper third of the shaft really provide the test case. Mr. Page rightly states that anybody who understands the mechanical problem of a fractured femur can get good results with diverse apparatus, especially, I would add, with the apparatus he is used to. But how many closed fractures of the upper third of the shaft in civil practice heal with 30 degrees of varus angulation, or come to open operation, with a doubtful result? Precisely for these fractures I believe the Braun splint to provide a great advance on the Thomas or Hodgen. The reason is that effective immobilization is almost impossible with the limb suspended freely; the fracture lies at the junction of the trunk, lying on the bed, and the limb, which therefore requires to be immobilized in relation to the bed, which is precisely what the Braun splint does. Two conditions are, however, essential: one is that the splint and limb are fully abducted, and for this a specially jutting fracture board is necessary, allowing the whole distal portion of the splint to lie off the mattress; the other is that the foot of the bed is sufficiently raised, usually 50 to 70 cm. (20 to 30 inches). Even infected fractures of the upper third of the shaft, with a dorsal drainage wound, do quite well and can be nursed. The worst cases of infected fractures of the upper third of the shaft must, however, in my opinion, go into plaster as the only way to provide the complete immobilization which such cases require.

Secondly, Mr. Page and Mr. Watson-Jones both query the advisability of applying traction through the condyles of the femur. Here I must plead guilty to inadequacy of statement. My words gave the impression that I advocated traction through the condyles as a routine, which I had not intended. For closed fractures of the shaft, which normally do not require more than four weeks of skeletal traction, I have always used, and certainly continue to advocate, traction through the crest of the tibia with a pin. For those gunshot fractures of the femoral shaft which escape infection and which approximate to closed fractures, I continue to regard this as the best treatment. But it is in fact the case that certain very severe open fractures of the shaft do require two or three times as long under traction, and in several such cases I actually observed loss of stability of the knee-joint developing (tested by loss of "locking" in experimental full extension—the knee being of course in flexion while the femur is under traction). For this reason I came to prefer traction through the condyles for such cases. But I would be the first to welcome a proposal that skeletal traction through the crest of the tibia should be applied to all fractured femurs of adults in war time, with subsequent traction through the condyles reserved for those cases that might require it after four weeks. I saw in Spain, for the first time, several cases of localized and very troublesome osteomyelitis of both tibia and femoral condyles, due to pins or wires, presumably left too long. But I can assure Mr. Page that I have handled a number of cases with Kirschner wire traction through the femoral condyles for four to eight weeks without any case of stiff knee. It seems from his experience at the pensions hospital that the method should not be used as a routine.

I fully agree with what Mr. Page says about overpulling. But there is no risk of this if a careful control is kept with a tape measure, with reduction of weight when and where indicated. In cases of acute infection there is really nothing to be gained by reducing whatever weight is necessary to maintain reduction. The treatment must consist essentially in opening up the sheaths which, as Mr. Page states, are distended, by means of longitudinal incisions, usually needed on both sides right down to the fracture. Such cases do excellently if all irrigation and other disturbance is then avoided.

In conclusion may I thank Mr. Page and Mr. Watson-Jones and express the hope that they will support my plea for the treatment of all fractured femurs in war time in specialized base hospitals or departments of hospitals. So far as air raid casualties are concerned, these can and should always reach such hospitals within six to twelve hours. Under field conditions it is of course impossible to achieve this. I believe the best solution to be the treatment of fractured femurs under skeletal traction for some ten days at an advanced base hospital, reached within twelve hours normally, if need be up to twenty-four hours. Spanish experience shows that this will normally secure freedom from infection. They would then be placed in plaster, applied under traction with hip and knee flexed, and under a spinal anaesthetic, and thus be transferred safely and comfortably to a permanent base, where the plaster would in most cases be removed and traction reapplied.—I am, etc.,

A. TUDOR HART.

Maidstone, June 24.

An Orthopaedic Unit for China

SIR,—During the past year the Chinese Red Cross has come to realize the importance of orthopaedics in war surgery and has sent an appeal for help to the British Orthopaedic Association. We are asked to provide a relatively small (250 beds) teaching unit, to be established well behind the Chinese lines, and a surgical director whose business it will be to instruct Chinese surgeons in orthopaedic surgery, so that they will then be able to deal more competently with the enormous numbers of wounded at other military and civilian hospitals. The sum required is £3,500—£10 for the equipment of each bed and £1,000 for special equipment required in the practice of orthopaedic surgery.

It is unusual for a small and purely scientific society like the British Orthopaedic Association to undertake a responsibility of this kind, but the appeal is such that it cannot be refused. The members of the Association have already given over £1,100 (the list of donations is below), but they cannot possibly subscribe the whole amount themselves. We are therefore asking, in co-operation with the British Fund for the Relief of Distress in China, for the aid of the medical profession as a whole.

These are difficult times, but there was never a period when it was so desirable to show that medicine is international in deeds as well as in words. This country has given the world Sir Robert Jones, the greatest orthopaedic surgeon of all time, and it is natural that another country, desperately in need of enlightenment in the treatment of limb and spinal injuries, should look to us. It is proposed to call the surgeon who goes to China "The Robert Jones Emergency Relief Surgeon."

The urgency and the importance of this appeal cannot be denied; if generous support is immediately forthcoming it will be possible to dispatch a surgeon with little delay, as arrangements for the administration of the fund in China have just been completed. Donations may be sent to either of the undersigned and should be marked "Orthopaedic."—We are, etc.,

NAUGHTON DUNN,
President, British Orthopaedic Association, 25, Calthorpe Road, Edgbaston, Birmingham.

H. GORDON THOMPSON,
Executive Secretary and Treasurer, British Fund for the Relief of Distress in China, 121, Westbourne Terrace, W.2.

June 28.

*** The following sums have been received from members of the British Orthopaedic Association whose names appear below: Two donations of 100 guineas, one of £50 14s. 10d., six of £50, one of 25 guineas, eleven of £25, three of £20, one of 15 guineas, two of £15, one of 10 guineas, four of £10, nine of 5 guineas, three of £5, one of 4 guineas, four of 3 guineas, one of £3, seven of 2 guineas, and eleven of one guinea. Total: £1,126 10s. 10d.

Anonymous, Mr. R. Barnes, Mr. W. R. Bristow, Mr. E. P. Brockman, Mr. Ralph Brooke, Mr. B. H. Burns, Mr. R. W. Butler, Mr. N. L. Capener, Mr. C. Hope Carlton, Mr. A. Chance, Mr. H. Chitty, Mr. J. A. Cholmeley, Mr. H. Osmond Clarke, Mr. S. G. Davidson, Mr. J. Dawson, Mr. Naughton Dunn, Mr. W. A. Eastwood, Mr. A. L. Eyre-Brook, Mr. W. B. Foley, Mr. L. Forman, Mr. A. Fowler, Sir Harold Gillies, Professor G. R. Girdlestone, Mr. A. M. Hendry, Mr. G. Hyman, Mr. C. Gordon Irwin, Mr. S. T. Irwin, Miss Jebens, Mr. E. B. Jones, Mr. C. R. M. Jones, Mr. R. Watson-Jones, Mr. C. Lambrinudi, Mr. R. S. Lawson, Mr. G. Lillie, Mr. Kelly, Mr. B. L. McFarland, Mr. T. P. McMurray, Mr. Grant Massie, Mr. W. Mercer, Mr. G. P. Mills, Mr. S. M. Milner, Mr. A. Mitchell, Mrs. Morley, Mr. R. C. Murray, Mr. T. P. Noble, Viscount Nuffield, Mr. G. T. Partridge, Mr. J. H. Paul, Mr. R. G. Pulvertaft, Mr. A. Quine, Mr. J. R. Ratcliffe, Mr. A. Rocyn Jones, Mr. N. Rocyn Jones, Professor Lambert Rogers, Mr. J. C. Scott, Mr. H. J. Seddon, Mr. W. Sirey, Mr. J. F. H. Stallman, Mr. R. Stirling, Mr. R. G. Taylor, Mr. V. J. M. Taylor, Mr. G. E. Thomas, Mr. Alan Todd, Mr. D. Trevor, Mr. W. E. Tucker, Mr. Philip Wiles, Mr. F. Aitken Walker, Mr. J. B. Ferguson Wilson.

Amputation, Excision, and Shock

SIR,—I have followed closely your admirable series of articles on war wounds and air raid casualties, and always found them highly interesting and instructive. In the *Journal* of July 1 (p. 27) Mr. Claude Frankau states that "excision as a means of eradicating sepsis in an infected joint is unsatisfactory in the larger joints owing to the shock of the operation." Numerous articles have recently appeared in the medical press which show that shock is caused mainly by overstimulation of nerve endings. But if these stimuli are cut off on their way to the brain, as is the case when spinal anaesthesia is employed, the danger of shock is greatly diminished if not abolished. It is surprising that this fact has not been mentioned, as everyone is familiar with the tremendous difference to the patient between having a stiff and shortened, but nevertheless a perfectly useful, leg, resulting from an excision, and a stump to which it may or may not be possible to fit an artificial leg. I agree that sometimes only amputation will save a patient's life, but there are cases where the substitution of spinal for some other form of anaesthesia may make all the difference between an amputation and an excision.—I am, etc.,

Edinburgh, July 2. M. LICHTENSTEIN.

Prevention and Treatment of Shock

SIR,—May I be allowed to reply at some length to Dr. H. K. Ashworth (*Journal*, June 24, p. 1304), whose sweeping criticism of my views and methods shows a singular lack of tolerance or even attempt at understanding.

To begin with he stresses the dangers of high spinal anaesthesia and doubts my ability to understand the physiological principles concerned. I know it is possible with heavy doses of percaine to reach an alarmingly high level of anaesthesia, as in Flint's classical case; but using 3 c.cm. of spinocain I have never known the level higher than the fifth thoracic segment. In this connexion the observations of Mr. J. Hughes are of interest (*Journal*, June 17, p. 1224). He states that with 12 c.cm. of light percaine, injecting between the third and fourth lumbar vertebrae, the maximum height obtained was not beyond the sixth thoracic segment. The cases of traumatic shock for which spinal anaesthesia is most obviously indicated are those due to injuries in the limbs or pelvis. In these 2 c.cm. of spinocain would be adequate, but no harm would follow the use of 3 c.cm. There is no need to embark on the very high spinal anaesthetics against which Dr. Ashworth warns us. The routine use of 3 c.cm. of spinocain will cover all cases without danger.

Let us now consider the problem of the blood pressure. With heavy doses of percaine and a high level of anaesthesia (a condition which I again insist is not necessary for the treatment of shock) it is an observed fact that the blood pressure falls. It is doubtful, however, how far Dr. Ashworth's four reasons are responsible for this. Kremer and Wright have shown (*Quart. J. exper. Physiol.*, 1932, **21**, 319) that after complete section of the splanchnic nerves, in spite of loss of vasoconstriction tone, the blood pressure is unaltered owing to the compensatory effects set up by the sinus and aortic nerves. A spinal anaesthesia is far short of a splanchnic section, and it is a common observation that pooling of blood in the abdomen does not normally occur during operations under spinal anaesthesia. Accordingly, even with anaesthesia to the second thoracic segment, which Dr. Ashworth will admit is seldom obtained, experimental evidence is all against a fall of blood pressure from the splanchnic side-effects. After dismissing this, Dr. Ashworth's other reasons are hardly worth considering. With the diaphragm still working the venous return to the heart must still be adequate. That the local stagnation of the circulation is a potent factor is directly disproved by Slome and

O'Shaughnessy, who showed that even the pooling of blood in a traumatized limb was not the essential factor in the lowering of blood pressure. Lastly, the sedative action of pre-anaesthetic drugs, if operative at all, is outside the scope of this inquiry.

Though I do not agree with Dr. Ashworth's physiology, I admit that a fall of blood pressure does occur in high spinal anaesthesia. With spinocain anaesthesia preceded by ephedrine—the usual technique—this fall does not normally occur, and, I repeat, the pressure is just as likely to go up or remain constant as to go down. The most important point, however, is that the falling blood pressure due to shock is arrested and a level of safety restored. In one of Slome and O'Shaughnessy's experiments—and there are dozens to choose from—the initial blood pressure of 130 mm. Hg fell to 60 mm. Hg as a result of trauma to the limb. After spinal anaesthesia and amputation the pressure rose 100 mm. Hg, returning to the original 130 mm Hg! According to Dr. Ashworth the giving of this anaesthetic was extremely dangerous and the animal should have died. The very conditions were present against which he warns us so uncompromisingly. It is a fact proved by a series of most careful and exhaustive experiments that the treatment of shock by spinal anaesthesia is a correct procedure, and sooner or later this difficult pill will have to be swallowed, even by anaesthetists of Dr. Ashworth's prominence. The exact type of anaesthesia and the levels to be reached are matters that future experience in air raids and gunshot injuries may standardize, but I refuse to have the method condemned by prejudice, sweeping statements, and the trailing of red herrings.

In conclusion, may I state that my principles, far from being dangerous, are founded upon a considerable experience and a volume of experimental backing, and, furthermore, that my methods of spinal anaesthesia, far from bringing discredit to a good method of anaesthesia, have produced many converts to a simple, efficient, and very safe technique.—I am, etc.,

London, S.W.19, June 29. N. L. M. READER.

Sodium Sulphate in Infected Wounds

SIR,—Some of us, for a number of years now, have been using sodium sulphate with outstanding success as an agent for hypertonic saline dressings, and have been surprised at the lack of its general adoption for this purpose. Moreover, even the principle of hypertonicity in the treatment of infected wounds has failed, in the twenty years or so since it was first promulgated, to appeal to the corporate imagination sufficiently to secure universal acceptance. For example, we have been surprised to find, in the series of articles on the treatment of septic wounds appearing in the *British Medical Journal* last year, in the article by Colonel Weddell on the treatment of wounds in war (April 15, 1939), and in the series of lectures on wounds in the Spanish War, recently published, no more than a passing reference to the use of hypertonic saline, and none to the use of sodium sulphate as the agent. The procedure of excising the whole wound, which is recommended in order to turn an infected injury into a sterile operation, is surely a confession of failure, and must often be totally impracticable.

This lack of general appreciation of what we believe to be a marked advance in the treatment of infected wounds appears very serious just now, in view of the possibility of enormous numbers of air raid casualties. I suggest that it is due to two failures on the part of the medical profession: (*a*) failure to appreciate the actual processes involved in septic inflammation, and consequently the solid theoretical grounds for hypertonic saline treatment; and (*b*) especially failure to realize the outstanding advantages of sodium sulphate over any other salt hitherto used for this purpose, advantages which in many cases mark the difference between success and non-success.

With a view to dealing with these difficulties I have for some time been engaged on an investigation, the results of which I hope to publish shortly. But meanwhile the possibility of imminent war makes the matter so urgent that I am writing these brief notes in the hope that surgeons and practitioners generally, especially those who will be in charge of first-aid posts and casualty clearing stations, may be persuaded at least to give a reasonable trial to sodium sulphate—10 per cent. solution applied continuously to the surface of wounds in the form of soaks.

In regard to the processes of septic inflammation, I suggest that septic oedema is unique in being the result partly of exudation of lymph from the blood capillaries and partly of stasis of the flow of lymph in the normal channels, caused by swelling up of the cells forming the lymph stomata and lymphatic capillaries. This cellular oedema I suggest to be a purely osmotic process, the result of damage to the cell walls by the bacterial toxins; and I suggest that the only means by which it can be reduced via the wound is by hypertonic applications that reverse the balance of osmotic pressure, without which reversal neither antiseptics nor fresh lymph can reach invading germs owing to lymph stasis. Actually no antiseptic other than fresh lymph is necessary. There is thus good ground for the axiom I ventured to enunciate four years ago (in "To-day's Uses for Yesterday's Drugs," *British Medical Journal*, November 9, 1935)—namely, that "an antiseptic, as applied to living tissues already invaded by micro-organisms, depends for its efficiency entirely upon whether it is hypertonic or not."

It is, however, important to choose the most suitable saline agent; and experiments which I have undertaken to try to reproduce some of the conditions *in vivo* show that for this purpose sodium sulphate, with its peculiar physico-chemical properties, is very exceptionally useful. I cannot here detail the experiments performed; they related to the fact that the value of a salt for hypertonic use depends not only on the maximum osmotic pressure of a tolerable solution but also on the rapidity with which a useful degree of osmotic pressure is exerted at a distance, after diffusion with albuminous fluid among various structures at body temperature. I may say, however, that the results are very striking, the curve of rising pressures showing at one stage that sodium sulphate exerted no less than three times the pressure of either magnesium sulphate or sodium chloride. This result confirms our experience that sodium sulphate is altogether better for hypertonic purposes than either of these salts. The only example of its practical use which I have space to give is taken from a letter from a naval surgeon, and shows vividly how useful this treatment is under war conditions:

"E. C. L., aged 31, leading seaman, on January 25, 1936, was accidentally wounded by the ricochet of a bullet from a piece of iron. He received thirty-one separate wounds, the majority of which were fortunately superficial. Eleven of the wounds were contaminated by pieces of a very dirty overall the man was wearing. The largest wound had approximately the following dimensions: $1\frac{1}{4}'' \times \frac{1}{4}'' \times \frac{1}{4}''$; the smallest about $\frac{1}{2}'' \times \frac{1}{2}'' \times \frac{1}{4}''$. I removed the pieces of clothing from the wounds and then applied large 'soaks' of sodium sulphate kept continuously wet. The wounds healed without the slightest suspicion of sepsis and within eight days of the time of the accident."

Doubtless other and still better salts than sodium sulphate will be found for this purpose; but meanwhile I suggest that it is partly because surgeons have persisted

in using magnesium sulphate and sodium chloride, neither of which is suitable, as the agents, that the hypertonic principle in the treatment of infected wounds has not been universally adopted. The aseptic principles of surgery which Lister initiated and which revolutionized procedure in the operating theatre are not applicable to the infected wounds found in general practice, in the casualty ward, on the battlefield, or after an air raid. An immense amount of suffering and disability can be saved if the principles outlined above are promptly accepted and acted upon by the medical profession.—I am, etc.,

York, June 30. J. C. LYTH.

The Abortion Report

SIR,—Will you allow me to correct a statement made by Dr. R. C. Webster in your issue of July 1 (p. 42) with regard to American statistics on the association between contraception and abortion. Although Professor Raymond Pearl in his *Natural History of Population* shows such an association to exist, his conclusions are qualified by a table on page 222. This states that the abortion rate for contraceptors is higher than for non-contraceptors among women who are very poor, who are poor, and who are in moderate circumstances, *but that the rates are lower among the well-to-do and the rich.* Of this table Pearl writes: "There (that is, amongst the well-to-do and rich) the situation appears to be that the practice of contraception is so highly efficient relatively that induced abortion is less often resorted to." The object in extending facilities for instruction in scientific contraception is to make available for all the methods now practised by the well-to-do. The Interdepartmental Committee on Abortion states: "There are, in our view, legitimate reasons for which advice can properly and, indeed, ought to be given; and we believe that, if it is carefully and wisely imparted for these reasons, the incentive to criminal abortion would often be removed, without the danger of serious repercussions in other directions."—I am, etc.,

MARGARET PYKE,
Hon. Secretary, The Family Planning Association,
July 3. 69, Eccleston Square, London, S.W.1.

Dental Sepsis and Anaemia, Dyspepsia, and Rheumatism

SIR,—I read with considerable interest the paper under the above title by Drs. J. M. Vaizey and A. E. Clark-Kennedy in the *Journal* of June 24 (p. 1269). It is admittedly negative, and I should like, if I may, by way of introduction to my few general remarks, to comfort the authors and myself by borrowing a few words from a leader in the *Times* of June 29 on cancer research which I have just been reading:

"Between ascertained fact and complete ignorance there exists an area of probability in which research workers are finding scope for their activity. This area has its dangers, since half-truth may be worse than no truth at all; but there is Darwin's authority for the view that 'no man can observe without a hypothesis.'"

The authors and myself appear to be in the same galley. They admit that their series of cases is too small to give any satisfactory indication of the truth, but they appear to have overlooked a factor of importance—namely, time.

It takes many years, fifteen, twenty, or more, for mouths to reach the condition in which it is necessary or advisable to remove all the teeth. During the whole of this time the patient has been suffering damage, whether from bacterial infection or from toxaemia does not matter very much. Some may be, and probably are, building up immunity, hence the cases of apparent good health in spite of unhealthy mouths; but an additional factor such as infection from another organism may break immunity down.

If, for the sake of argument, it be agreed that the teeth are the primary cause in certain cases of dyspepsia and rheumatism, their removal cannot be expected to result in an immediate cure of the condition which they have brought about. If a fire begins in the kitchen and spreads to the parlour, putting it out in the kitchen will not extinguish the fire in the parlour. Indeed, the fire in the parlour may go on after the kitchen is burned out, until the whole house is destroyed. So with the sepsis which may follow tooth infection.

The authors admit there are cases of acute or subacute arthritis in which the removal of infected teeth is followed by a marked improvement. But it is not surprising that symptoms of arthritis and dyspepsia may follow for the first time after the removal of the teeth. It does not necessarily follow that the teeth were not responsible for starting the original infection. The authors say that in certain cases Koch's postulates are not fulfilled. Would this not apply to many other cases in which cause and effect are generally accepted?

With regard to dyspepsia, is it not logical that if the teeth were removed and the edentulous patient *not put on a suitable diet* dyspepsia should supervene, even "for the first time"? If we admit that from the purely mechanical point of view infected teeth are better than none, we are ignoring the further damage which may be caused by infection, whether this takes place locally through swallowing or through the bacteriaemia known to occur during the act of mastication in such cases. Further, if the dyspepsia is caused in the first place by the infection of gastric mucosa from the teeth, is it not likely that the removal of the teeth, forcing on the patient the added disability of the mechanical difficulty on the already weakened mucosa, may aggravate the patient's condition, as the authors state?

Finally, the authors condemn the indiscriminate removal of teeth on the theory that it will influence the course of rheumatism. In this condemnation dental surgeons will agree, but has it ever been advocated?—I am, etc.,

F. ST. J. STEADMAN,
D.P.H., L.R.C.P., M.R.C.S., L.D.S.,
London, W. Senior Dental Surgeon, Royal
June 30. Dental Hospital.

SIR,—I have read the paper by Drs. Vaizey and Clark-Kennedy and I agree with them that the results of wholesale extractions of teeth as a curative measure are most disappointing, except in a few isolated cases. But this does not prove that the dental sepsis was not the original cause of the trouble, even in those cases where the teeth were extracted before the apparent onset of the disease. It is not reasonable to expect much benefit to result from the removal of a primary source of sepsis when secondary deposits already exist. The main object of dentistry should be prevention rather than cure.

I take it for granted that the 234 edentulous patients examined had their teeth removed for gross dental sepsis. The real crux of the problem is this: What would have been the condition of these patients if their dental sepsis had never been allowed to develop? This is a question which of course we cannot answer. But it seems to me that a condition of multiple abscesses in bone cannot be anything but a potential source of danger.—I am, etc.,

Cambridge, June 25. F. H. SMITH.

Pulmonary Carcinoma and Silicosis

SIR,—In an interesting article on anthra-silicosis and bronchial carcinoma with quiescent tuberculosis in the *Journal* of July 1 (p. 8), Dr. J. E. Lovelock quotes Dr. C. S. Anderson and myself as having said, in a paper published in the *Journal of Hygiene*, March, 1938, that "as a group of cases of pulmonary carcinoma exists in which the organs contain an excess of silica and show histological evidence of silicotic fibrosis, the role of silicosis is definitely aetiological." What Dr. Anderson and I did say, after a careful investigation of the evidence, was: "A group of cases of pulmonary carcinoma exists in which the organs contain an excess of silica and show histological evidence of silicotic fibrosis. The conclusion, we think, is that the role of the silicosis is aetiological." We chose our words carefully and were deliberately dogmatic, but we did not push our dogmatism quite to the length to which Dr. Lovelock credits us with having gone. I would repeat the celebrated advice once offered to a young aspirant towards publication: "Verify your references."—I am, etc.,

London, W. 12, June 30. J. HENRY DIBLE.

Bee-sting Anaphylaxis

SIR,—In reply to the letter by "Apiarist" (*Journal*, June 24, p. 1306), I would say that, although I myself have not had such a case, insect bites and bee stings are well known to cause anaphylactic phenomena. Rowe of California has described such cases, and Goodman in 1932, Artzen in 1933, and Duke in 1927 have all recorded fatal cases of anaphylaxis due to bee stings. Lincoln in 1936 described a case in the *Journal of Allergy* which corresponds very closely to that of "Apiarist." The patient had seven wasp stings and suffered from severe urticaria, oedema, nausea, involuntary urination and defaecation, and great shock. I should think that bee stings would act in a similar manner to wasp stings. In the case of "Apiarist" the difficulty of inspiration was probably due to an oedema of the laryngeal mucosa similar to that encountered in angioneurotic oedema, and the fact that his condition was improved by the injection of adrenaline points to the probability that the condition was of an allergic character. Ellis and Ahrens have reported cases where they have successfully desensitized patients by means of extracts made from bees. One would suggest, however, that once "Apiarist" has been sensitized he would be well advised not to run the risk of being stung again.—I am, etc.,

Liverpool, June 25. J. BERNSTIEN.

Importance of Blood Examination

SIR,—Those of us who have had—fortunately or unfortunately—sufficient time to do, as a routine measure, most of the blood investigations mentioned by Mr. Herbert H. Brown (*Journal*, June 17, p. 1257) realize how true and important are his recommendations. As a very simple and ready "aid" they make a "P.U.O." less likely as an early diagnosis, and certainly help in differentiating influenza from other febrile conditions. I have had, for example, several children in a school suffering from symptoms that were similar, all with high temperatures, at a time when influenza was prevalent, but with leucocyte counts that immediately differentiated them, one group with a leucopenia (3,000 to 5,000 white cells per c.mm.) and the other with a leucocytosis (13,000 to 20,000 white cells per c.mm.), so that not only had they to be segregated into two groups but early treatment with prontosil or M & B 693 was indicated in those with the high count. What one has found of great help in school work has been to have a blood picture record of every boy or girl on admission in normal health. It will show on the dossier of each individual the polymorph-lymphocyte ratio, the monocyte–lymphocyte ratio, whether platelets are abundant or deficient, and especially the eosinophil content and their normal Von Bonsdorff figure, and therefore in illness any deviation from this.

I agree with Dr. A. Gardner (June 24, p. 1305), and after many years find it necessary and satisfactory, as an amateur, to use two double counting chambers and two pipettes for each white and red cell count. In the white cell count I use the measured microscopical field instead of the ruled part of the slide only. If, in addition, there is someone around to take down the red and white cell figures, and one has counters or beans (200) with a separate bowl for each type of white cell, including five for the polymorphonuclear count, the time taken is much curtailed and interestingly and usefully spent.—I am, etc.,

Battle, Sussex, June 24. H. ANGELL LANE.

Anaesthesia in War Time

SIR,—The correspondence on this subject up to date tends to give the impression that anaesthesia differs in war and in peace. It appears to me that the problems confronting the war-time anaesthetist are precisely the same as those he encounters daily in civil practice. Certain factors may be more prominent, such as the frequent occurrence of psychic and traumatic shock, and the equipment will probably be more limited. The principles of anaesthesia, however, remain exactly the same, including those learnt during the last European war, such as the importance of preliminary anti-shock treatment and the avoidance of chloroform, ether, and high spinal blocks in badly shocked patients. No one method of anaesthesia or analgesia can be standardized, least of all any particular type of apparatus euphemistically termed a "robot anaesthetist." The problem of saving the maximum number of lives can only be solved by an adequate supply of fully trained anaesthetists. This cannot be done quickly, but a start has already been made by the institution of the D.A. diploma and the Nuffield Chair of Anaesthesia, both of which have stimulated much interest in this important specialty.—I am, etc.,

London, N.W.8, July 1. C. LANGTON HEWER.

SIR,—"Love is blind," and Dr. T. B. Jobson (*Journal*, July 1, p. 40) so loves his apparatus that he is blind to the critical point of my letter. This was obviously that I resent his instrument being put forward as "an exceptionally useful apparatus in time of war." I was not concerned with its merits in any other respect, and Mr. Jobson's letter shows that though I may be, which I hope I am not, rude, he at any rate is irrelevant; and I made no allusion whatever to surgical apparatus.—I am, etc.,

London, W.1, July 1. J. BLOMFIELD.

Dr. H. Beecher Jackson, coroner for Croydon, was elected president of the Coroners' Society of England and Wales on June 29, and Dr. W. Bentley Purchase, coroner for North London, was appointed honorary secretary in succession to the late Mr. F. Danford Thomas.

Universities and Colleges

UNIVERSITY OF LONDON

The University Studentship in Physiology for research in physiology, of the value of £100, has been awarded to Ina M. Young of Bedford College.

UNIVERSITY OF EDINBURGH

On June 30 the honorary degree of LL.D. was conferred on J. Clarence Webster, C.M.G., M.D., F.R.C.P.Ed., formerly Professor of Obstetrics and Gynaecology, Rush Medical College, University of Chicago.

UNIVERSITY OF GLASGOW

The Senate of the University announces that the Struthers gold medal and prize have been awarded to George M. Wyburn, D.Sc., M.B., F.R.F.P.S.G., for an important series of embryological studies embodied in papers published in the *Journal of Anatomy* in January, 1937, April, 1938, and January, 1939. The Harry Stewart Hutchison prize has been awarded to James Holmes Hutchison for his dissertation entitled "The Iron-deficiency Anaemia of Childhood."

At a graduation ceremony on June 30 the following medical degrees were conferred:

M.D.—*J. D. P. Graham, †J. A. Crocket, †T. R. Pahwa, F. W. Bunting, J. M. Henderson, A. Lyall, A. McD. Steel.

The Asher Gold Medal for Laryngology and Rhinology was awarded to A. J. Hird.

* With high commendation. † With commendation.

UNIVERSITY OF BIRMINGHAM

At a Congregation on July 1 the following medical degrees were conferred:

M.D.—C. H. Catlin.

M.D. (STATE MEDICINE).—D. F. McCarthy, J. V. Walker.

M.B., CH.B.—*‡P. H. Davison, *‖B. A. E. Johns, †¶P. W. W. Gifford, †‡P. F. J. Hickinbotham, †Y. D. Williams, G. M. Barling, G. H. Boston, Anna R. Burrows, H. R. Chapman, J. S. I'A. Chesshire, Agnes H. Crozier, Doreen Davies, Margaret B. Davies, J. A. Duncan, T. B. FitzGerald, D. C. Galloway, A. A. Gattas, V. B. Goldman, Marion W. S. Green, P. Harris, D. S. Johnson, H. Kenyon, Elizabeth B. Linday, W. K. Lloyd, D. J. Macmillan, L. Marx, P. Morrell, Margaret A. Norton, D. G. Richards, Eleanor M. Sawdon, Dorothy W. Smith, E. T. M. Smith, D. H. Thompson, Margery B. Webb.

The following scholarships, medals, and prizes have been awarded.

Queen's Scholarship (third year), J. C. Fulford; (fourth year), Evelyn M. Roe; (fifth year). Ruth Lockie; (final year), B. A. E. Johns. *Ingleby Scholarships*, P. H. Davison, P. F. J. Hickinbotham. *Arthur Foxwell Memorial Medal, Sampson Gamgee Memorial Medal, Priestley Smith Prize in Ophthalmology, Russell Memorial Prize,* and *Butterworth Prize*, B. A. E. Johns. *Leith-Newman Prizes in Pathology* (fourth year), Medical, M. C. Binnie; Dental, C. H. Oakes. *Peter Thompson Prize in Anatomy* (third year), W. H. Bond. *John Barritt Melson Gold Medal in Physiology* (third year) and *Bertram Windle Prize in Anatomy*, J. C. Fulford. *Foyle Prize*, Beatrice D. Cluley.

* First-class honours. † Second-class honours. ‡ Distinction in medicine and midwifery and diseases of women. ‖ Distinction in medicine and surgery: ¶ Distinction in medicine.

UNIVERSITY OF BRISTOL

The following appointments have been made for 1939–40: Dr. Norman Wood, Lecturer in Pathology; Dr. R. G. Cookson and Dr. Hilda R. Dutton, medical officers for men and women students respectively; and Professor C. Bruce Perry, M.D., F.R.C.P., Clinical Dean at Bristol General Hospital.

Dr. Vincent Magee has resigned the post of Lecturer in Pathology on taking up an appointment at Warrington Hospital.

Dr. Beryl D. Corner has been awarded the Beaverbrook Fellowship (renewed).

E. Philipp has been approved at the examination for the degree of M.D.

UNIVERSITY OF DURHAM

The following candidates have satisfied the examiners at the examination indicated:

M.D.—*Special Examination:* G. A. Smart, R. H. Vasey. *By Essay:* E. S. Kirkhouse, J. W. C. Leech (with commendation), F. J. Lorriman, S. J. C. Mackay, A. G. Ogilvie (with honours), G. R. Peberdy, E. Smith.

FINAL M.B., B.S.—*†R. A. Fleming, *Brenda Morrison, *J. Simpson, W. C. Barnsley, S. Bell, T. A. S. Brown, F. E. Butterfield, D. Cant, H. Carr, J. H. Craig, R. T. G. Craig, Kathleen H. M. Dunn, L. Fairbairn, Beryl Gibbs, H. P. Graham, J. G. Guest, R. N. Harbinson, Marion Harrison, F. I. Herbert, K. R. Hudson, J. N. T. Hutton, R. M. Johnson, K. Kumar, F. Laws, P. A. Maughan, J. I. McConnell, G. Pringle, T. A. G. Reed, Helen Richardson, J. C. T. Roberts, †Sybil J. Russell, W. Sherlaw, K. G. Wilmot, Helen R. Wilson, Lilian M. Witter, A. W. Woodruff.

B.HY. AND D.P.H.—C. Bainbridge, T. Fletcher (with distinction in Part I), S. Hewitt, M. Walton, G. H. Whalley.

* With second-class honours. † Distinction in Midwifery.

UNIVERSITY OF LIVERPOOL

On July 1 the honorary degree of M.Ch.Orth. was conferred on Mr. H. A. T. Fairbank, M.S., F.R.C.S., consulting orthopaedic surgeon and emeritus lecturer in orthopaedic surgery at King's College Hospital, London.

The following candidates have been approved at the examinations indicated:

M.D.—A. Ashworth, Phillis Dingle, F. Glyn-Hughes, N. M. Hancox, G. E. Hesketh, F. T. Madge, T. H. Pierce.

CH.M.—H. L. Davies.

M.B., CH.B.—[1] [2] [4]D. M. I. Freeman, [2] [3]R. M. Evans, [2] [3]Pearl Lyons. *Part III:* S. Ball, A. R. Bracey, Frances E. Brierton, R. F. Browne, W. E. Coates, Florence M. E. Davies, E. T. Downham, Margaret Edge, T. S. Eimerl, S. Ellenbogen, H. B. Forrest, J. A. Gillet, C. M. Gregory, H. Hall, E. L. Hamm, J. Harders, F. Hedley, Bessie Howarth, H. Ingham, C. T. Jenkins, R. R. Knowles, A. L. Latner, P. C. Lawson, Anne E. McCandless, Sylvia Makin, Eileen E. V. Martin, E. F. Mason, R. J. Miller, G. W. H. Millington, J. D. Muir, T. Murtock, A. G. O'Malley, R. J. Parry, Margaret E. Parry-Edwards, R. Paul, Eleanor M. Pearson, L. G. Poole, A. G. Porterfield, T. Price, Kathleen Pugh-Jones, V. A. Rogers, C. R. Sluming, W. O. Spence, Lucy M. Sutcliffe, Catherine S. Thomas, G. O. Thomas, Megan E. Thomas, Joan P. Thomson, J. N. Threlfall, Olivia S. Turner, J. A. Wethered, A. G. Williams. *Part II:* I. Ansell, S. C. Barnes, H. N. C. Bleasdale, G. J. C. Brittain, D. J. Browne, Helen M. Carmichael, W. F. Christian, [4]E. A. Cookson, N. A. G. Covell, Grace T. Dawson, [2]D. W. Ellis-Jones, W. E. Gill, H. G. Griffin, A. H. Hands, [2]J. B. Hannah, [4]Catherine W. L. Harries, R. Hermon, J. R. Hughes, [4]W. J. Hughes, [4]Jean G. Huntley, [2]C. Ibbotson, [4]C. N. Iland, R. V. Imundi, I. Levinson, Joan F. Macara, M. G. McColl, [4]A. K. Mitting, [4]J. G. Mott, S. B. Nelles, G. V. Osborne, W. H. Patridge, W. Rotheram, Kate E. Rymer, T. A. Sale, C. C. Slack, Beryl M. Smith, R. A. Smith, F. L. Thomas, [4]E. E. Vaughan, [4]G. R. Wadsworth, Hilda Walker, Kathleen M. Walters, Agnes M. Williams, Mair Williams, E. H. Winterbottom. *Passed in Individual Subjects:* R. T. Davies, L. Fletcher, and J. G. Gow (Forensic Medicine and Toxicology), Lettice M. Robertson (Public Health). *Part I:* Katharine E. Ainsworth, [5]R. A. Allen, [7] [8]G. M. Ardran, Olive R. Ballance, Anita M. Beck, W. H. Berry, A. K. Bingham, G. J. C. Brittain, W. P. Clothier, R. S. Cook, [8]J. A. Donnellan, C. V. Donnelly, J. J. Ennitt, [8]B. B. Evans, Elizabeth S. N. Fenton, H. E. D. Flack, H. W. Forshaw, G. L. Gamble, N. O. K. Gibbon, H. Hall, J. J. Hargadon, I. J. Harris, S. Horrocks, J. H. Hughes, M. W. Hutchings, Katie H. Jones, Mair E. Jones, N. B. Jones, W. J. Jones, Mary Jordan, A. C. Kirby, C. A. Kovachich, T. E. Lamb, D. Leslie, T. B. McMurray, M. Makin, K. J. Mann, Y. Mansour, Lucy D. Meyrick, J. Moorhouse, J. A. B. Nicholson, J. D. F. Norman, C. N. Partington, D. E. Paterson, H. C. Percy-Hughes, G. H. Pimblett, Joan E. M. Potts, A. G. Rickards, F. S. Rickards, M. Rosenthal, W. Rotheram, G. D. Scarrow, [8]G. L. Shatwell, [7] [8]J. M. Swithinbank, W. G. Taaffe, W. L. Turner, E. Walker, Kathleen Walters, C. W. Walton, D. Whitaker, A. S. Whitehead, J. K. Wilson, J. Winter, F. J. Zacharias. *Passed in Separate Subjects:* A. S. G. Binnie, A. J. Goldman, and T. O. Hughes (Pharmacology and General Therapeutics).

D.P.H.—*Part I:* H. D. Collins, Margaret J. Roberts. *Part II:* J. C. Birchall, C. Coleiro, H. D. Collins, E. C. R. Couper, J. N. Das, [9]Beryl Edgecombe, Ivy F. Fallon, Elsie O. Hughes, J. Leiper, F. T. Madge, E. H. Moore, Moira Murray.

DIPLOMA IN TROPICAL HYGIENE.—J. M. Caldwell, S. G. Cowper, L. G. Eddey, W. H. R. Lumsden, K. Nadarajah, T. S. Outerbridge.

DIPLOMA IN MEDICAL RADIOLOGY AND ELECTROLOGY.—*Part B:* B. M. Maxwell, W. Niven.

[1] First-class honours. [2] Second-class honours. [3] Distinction in surgery. [4] Distinction in obstetrics and gynaecology. [5] Distinction in forensic medicine and toxicology. [6] Distinction in public health. [7] Distinction in pathology. [8] Distinction in pharmacology and general therapeutics. [9] With distinction.

UNIVERSITY OF MANCHESTER

Dr. J. N. Marshall Chalmers has been appointed Assistant Director of the Laboratory of Clinical Investigations and Research.

The following candidates have satisfied the examiners at the examination indicated:

M.D.—S. Almond, G. C. Eastwood (with commendation), Evelyn M. Holmes, A. E. Martin (gold medal), C. S. Parker, H. T. Simmons, C. Starkie.

Obituary

PERCY ANDREW STEEDMAN, M.R.C.S., L.R.C.P., of Rawlinson Road, Oxford, who died on June 17, was born in South Africa in 1851. He came to England as a student and entered St. Bartholomew's Hospital, where he obtained the Brackenbury Surgical Scholarship in 1876. He was resident clinical assistant at the City of London Hospital for Diseases of the Chest, resident medical officer of Charing Cross Hospital, and held a prosectorship of the Royal College of Surgeons. He practised for some time at Harewood in Yorkshire, and in 1892 settled in Oxford, where he quickly obtained a reputation for good practice among the residents of North Oxford. He had been a member of the British Medical Association for forty years. He married in 1878 Priscilla Wordsworth, the daughter of the Bishop of Lincoln and a great-niece of the poet Wordsworth. Mrs. Steedman died in 1915. There were three daughters of the marriage, one of whom died recently of a rare blood disease. Steedman's practice in Oxford was never large, and was chiefly among substantial retired folk, especially of the clergy and their connexions. He cycled from patient to patient, and even after retirement he cycled until a few months before his death. He was not ambitious as regards position or rewards, and was content to serve his patients' wants with scrupulous care. He reckoned to spend a certain time with each patient resolving their doubts and difficulties, and with his chronic patients, of whom he had many, he made his weekly or monthly visit so that it became an event in their lives to which they looked forward. He was never in a hurry. But with all the care that he gave in the little things of practice he was a good doctor, and did not miss serious disease or the importance of symptoms and signs. He carried with him a confidence and an urbanity that may best be described as "patrician," but it was tinctured by humility and a Christian faith of which he never spoke. He was an ideal family practitioner, and in return was beloved by all with whom he came into contact.

Dr. JAMES SPENCE GEDDIE, who died on June 27 at Accrington, aged 59, had for many years past devoted himself to diseases of the eye and ear, and worked in partnership with his brother, Dr. C. M. Geddie of Blackburn. The son of an Accrington doctor he studied medicine at Aberdeen University and Owens College, Manchester, and graduated M.B., Ch.B.Aberd. in 1901. He then served as clinical assistant at the Royal London Ophthalmic Hospital (Moorfields), and as ophthalmic and aural house-surgeon at the Wolverhampton and Midland Counties Eye Infirmary, and the Preston Royal Infirmary. After settling in practice Dr. J. S. Geddie became honorary ophthalmic and aural surgeon to the Victoria Hospital, Accrington, to the Colne Society for Aiding the Blind, to the Teachers' Benevolent Society, and to Stonyhurst College; he was also ophthalmic surgeon to the Pike Law Infirmary at Rawtenstall and the Hospital for Mental Defectives at Whalley, and specialist medical referee for diseases of the eye to County Court Circuit No. 4. He joined the British Medical Association in 1906 and was a member of the Ophthalmological Society of the United Kingdom and the Oxford Ophthalmological Congress.

The death occurred on June 24 of Mr. WILLIAM CHARLES O'SULLIVAN, aged 79, who had been in the Government service for over fifty-seven years, and for the last forty-nine years was engaged as clerk to the Inspector of Anatomy under the Anatomy Acts, the administration of which was taken over from the Home Office by the Ministry of Health in 1920. Mr. O'Sullivan's interest in the successful administration of these Acts was remarkable, and won for him many friendships among professors of anatomy and other officials of the medical schools. His enthusiasm for his work was exemplified by the fact that he requested that his body should be used for anatomical purposes.

Medical Notes in Parliament

In the House of Lords progress was made this week with the Charitable Collections (Regulation) Bill and the Civil Defence Bill. The latter passed through committee on June 28. Amendments were made, but they do not alter the medical provisions of the Bill, which were not debated.

The Marriage Bill and the Civil Defence Bill were considered on the report stage in the House of Lords on July 4. The Unemployment Insurance Bill and the Local Government Amendment (Scotland) Bill were read the third time on the same day and passed.

Lord Greville has given notice to raise the proposed appointment of a Director-General for the Evacuation of London Hospitals.

The House of Commons this week completed the committee stage of the Finance Bill and discussed the Estimates for the Scottish Department of Health. The Milk Industry Bill was down for second reading. During the consideration of the Finance Bill on July 3 the House of Commons negatived the schedule repealing enactments relating to the Medicine Stamp Duties.

There were presented to the House of Commons on July 3 a return relative to experiments on living animals; a Silicosis and Asbestosis (Medical Arrangements) Amendment Scheme, 1939; a Various Industries (Silicosis No. 2) Amendment Scheme, 1939; and also the first report of the Committee on Nutrition in the Colonial Empire, Parts I and II.

Silicosis

Mr. GEOFFREY LLOYD stated on June 22 that no cases of silicosis had been certified among miners in Cheshire. As regards Lancashire, in the seven and a half years between June 1, 1931, and December 31, 1938, the medical board granted twenty-nine certificates for coal-miners and three for sandstone-miners. The average number of cases was about four a year and somewhat higher over the later years, but fluctuations in such small figures made it difficult to say whether the incidence of the disease was increasing, bearing in mind that it usually took years to develop. Measures to suppress or collect dangerous dust were taken wherever necessary.

Answering Mr. James Griffiths on June 22 Mr. PEAKE said the amending Various Industries (Silicosis) Scheme was made on June 12, and extended the limit in the proviso to paragraph 4 of the principal scheme from three to five years. Sir Samuel Hoare had no power to make it retrospective. He had, however, suggested, through the Mining Association, that the colliery owners might undertake to deal with claims where the workman had been employed in the mines within the three years preceding the date of the amending scheme, as if the limit in their case was five years and not three. This suggestion was under consideration.

Grant to British Red Cross Society

Sir JOHN ANDERSON stated on June 22 that for some years a grant had been made to the central headquarters of the British Red Cross Society in respect of the work which they undertook in connexion with the training of volunteers for the civil defence services. The financial arrangements with the Society were now being reviewed again by his Department and the Ministry of Health.

Cheap Milk for Maternity and Child Welfare Schemes

Sir R. DORMAN-SMITH informed Mr. T. Smith on June 26 that while he was hopeful that it would be possible to introduce in the near future a scheme for the supply of milk at

reduced prices to English local authorities in connexion with their maternity and child welfare arrangements, negotiations to that end had not yet been completed. No sums had therefore as yet been paid under the Milk (Extension and Amendment) Act, 1938, in respect of milk supplied under such a scheme in England. A scheme had, however, been introduced for the area of the Scottish Milk Marketing Board.

Medical Benefit during Stay in Guernsey

On June 26 Mr. BERNAYS, replying to Mr. Parker, said that under a specific provision of the Insurance Act an insured person was not disentitled to sickness, disablement, or maternity benefit while he was temporarily resident in the Channel Islands. The Minister of Health could not undertake to make arrangements for providing medical benefit to insured persons when they were outside this country, although if a scheme of national health insurance were established in the Channel Islands reciprocal arrangements could be made whereby persons insured in the United Kingdom who went to those islands could receive medical benefit under the island scheme.

Horse-power Tax Increase

During the discussion of the Finance Bill in Committee of the House of Commons on June 27 Mrs. TATE moved an amendment to exempt from the increased tax motor-cars owned or used by maternity and district nurses for the purposes of their work. Captain CROOKSHANK said that while they all recognized the value of the work of these ladies, that was not a sufficient reason for exempting alone the cars used by them. Doctors could claim that their work was humanitarian in the same way as nurses, and veterinary surgeons could say that their work was equally important.

The amendment was negatived, and the clause increasing the horse-power tax was carried.

Health of Recruits

Applications to join the regular Royal Air Force during the twelve months ended June 17 were 91,447; 41,325 acceptances resulted from these applications. There were 18,103 rejections on medical grounds. The principal reasons for such rejections were visual defects and physique below the required standard. The recruits finally approved for the Regular Army during the calendar year 1938, and during the period January 1 to May 31, 1939, were 38,827 and 20,197 respectively. The applicants for enlistment into the Regular Army during the periods in question who were rejected at medical examination were 7,299 and 3,278 respectively.

On June 27 Mr. G. MACDONALD asked the Secretary of State for War the number of persons offering themselves for enlistment who, on being found below standard, had been sent to one of the recruits physical development depots, and whether the results had been satisfactory. Mr. HORE-BELISHA said that the number sent to the depots was 2,775. Of these, 2,044 had been posted to units as fit and only 196 failed to reach the standard after training.

British and Foreign X-ray Apparatus

On June 29 Mr. HOPKIN asked Dr. Elliot to set up a committee of investigation to inquire into the present state of efficiency of *x*-ray plant in hospitals and to report on the relative efficiency of British and foreign plant, and on the provision of spare parts of foreign plant in case of war. Mr. Hopkin pointed out that the London County Council insisted on using British plant only. He suggested the appointment of a highly qualified engineer to assist the Cancer Commission to bring British-made *x*-ray plant to the favourable notice of all hospitals. Dr. ELLIOT answered that he knew British-made *x*-ray apparatus had been found to be efficient and that the apparatus used in London County Council hospitals was almost entirely of British make. He did not think it desirable to adopt the suggestion made for the appointment of an engineer.

Medical Examination for Militia

Dr. SUMMERSKILL asked on June 29 what instructions had been issued to the medical boards charged with examining militiamen as to the standard of health required for service. Mr. ERNEST BROWN replied that he was having a copy of the instructions placed in the library of the House. These instructions were long and elaborate. Dr. SUMMERSKILL asserted that men were being passed fit for service who were regarded as chronic invalids. Mr. BROWN said he was not aware of that.

Dr. SUMMERSKILL further asked whether a militiaman who had an unsatisfactory medical history and was dissatisfied with the decision of the examining doctor was given the right to appeal for a second opinion from a specialist. Mr. BROWN said the decisions of the medical boards were final, but arrangements were made for men to be referred to consultants for report when the boards were in doubt.

Dr. SUMMERSKILL argued that if a man had certificates over a number of years certifying him as suffering from a complaint which might be obscure to a new doctor who examined him, that man should have the right to appeal to a specialist on his complaint. She added that many members had cases sent to them of men who had been certified as suffering from a complaint but were now passed fit for service.

Mr. BROWN said he hoped members would send on such cases to him. He had been struck in the last fortnight by the small number of letters he had received on this subject.

Mr. RHYS DAVIES asked on June 29 whether the medical personnel examining militiamen was the same as in the case of those joining the regular forces; if not, how this personnel had been chosen. Mr. BROWN, in reply, said the medical boards set up under the Military Training Act were composed of civilian doctors selected by the Ministry of Health from lists supplied by the British Medical Association. The percentage of men found unfit for any form of military service up to June 20 was 2.6 in the case of the examinations under the Military Training Act. Mr. RHYS DAVIES asked whether the qualifications of the doctors who were examining under the Military Training Act were the same as those of the doctors who examined for the Regular Army. Mr. BROWN said their qualifications were of the highest kind.

Administration of Medicine Stamp Duties

In a reply on June 29 to Mr. J. A. de Rothschild Sir JOHN SIMON said the Department of Customs and Excise, which was responsible for the administration of the Medicine Stamp Duties, represented to him the extreme difficulties of adminstering the existing duty and the many anomalies involved. With these considerations in mind he felt that the repeal of the duties was desirable. The Parliamentary Committee of the Co-operative Congress and the Proprietary Association of Great Britain conveyed to him their views in favour of the repeal of the duty; moreover, the Pharmaceutical Society of Great Britain, after criticizing the Select Committee's recommendations, represented to him that no reasons were advanced in the report, nor were any substantial reasons given in evidence before the Committee, why medicines should be preferred for taxation before many other more obviously suitable commodities, and that they could not find in the report any justification for the imposition of a heavy duty upon the products of one particular industry, and that an industry concerned with the public health. He would carry on as well as he could during the next twelve months, but there remained extreme difficulty in the administration of these duties. He had no means at his disposal to distinguish the patent medicines which were advantageous to the public health.

Medical Certificates for Juvenile Employment

Mr. MESSER asked on June 29 whether Sir Samuel Hoare had considered resolutions sent to him urging the granting of provisional medical certificates only for the employment of juveniles under 15 years of age after September 1, 1939. Mr. PEAKE replied that Sir Samuel had received one such resolution,

but the provisions on this subject in Section 99 of the Factories Act only authorized the issue of provisional certificates in cases where, after examining the young person, the surgeon required further information or further time for consideration before deciding whether to issue a certificate of fitness or as to the conditions to be attached to it. It would be inconsistent with the statutory provisions to lay down any general rule that this procedure was to be followed in the case of all young persons below a certain age.

Maternity Services: Circular 1705

On July 3 Mr. GORDON MACDONALD asked whether Dr. Elliot was satisfied that the powers invested in the advisory committee set up under Circular 1705 were not excessive, in so far as they interfered with the free and unrestricted practice of midwifery, etc., assured to every legally qualified and registered practitioner under the Medical Acts. Mr. BERNAYS replied that the functions which Circular 1705 suggested might be exercised by an advisory committee of the kind referred to in the circular related to a list prepared by a local authority for the purposes of a public service. Dr. Elliot could not agree that they interfered with the rights of medical practitioners to practise midwifery. The Minister was not aware that the suggestions in the circular respecting the functions in question had the disapproval of a large body of medical opinion.

Mr. Bernays also informed Mr. Macdonald that Circular 1705 did not impose or purport to impose a limitation on the choice of an expectant mother so to prevent her from having the services of her family doctor should she so desire. The procedure suggested in the circular contemplated that ordinarily some practitioner on the list prepared by the local supervising authority would be acceptable to the expectant mother. The circular made it clear that where this was not the case and the expectant mother desired the services of some other duly qualified medical practitioner this practitioner should be called in by the midwife.

Mr. GORDON MACDONALD also inquired on July 3 for the names of the advisory committee for the area of the Lancashire County Council, set up in consequence of Circular 1705 of the Ministry of Health. He asked what consultations took place prior to the setting up of the committee. Mr. BERNAYS replied that the committee was: *Chairman*, Dr. Hall, County Medical Officer; *Obstetric Consultants*, Professor Leyland Robinson, Professor Dougal; *General Practitioners*, Dr. March, Dr. Winstanley. Before making these appointments consultation took place, as suggested in the circular, with the organizations of medical practitioners which appeared to the county council effectively to represent the opinions of practitioners in the county. The President of the Royal College of Obstetricians and Gynaecologists was approached with regard to the appointment of the two obstetric consultants, and the general practitioners and their deputies were nominated for appointment by the Lancashire and Cheshire Branch of the British Medical Association.

N.H.I. Contributions and Expenditure

The amount of the health insurance contributions paid by employers and employed persons in Great Britain for the year ended December 31, 1938, was approximately £29,859,000, and for that year the total amount of the expenditure on the several health insurance benefits was approximately £33,961,000. The total cost of administration (including the central departments' administration) was approximately £5,968,000. Dr. Elliot has stated that he has no figures as to the number of persons whose national health insurance has been terminated after the free period of about twenty-one months by reason of their not having satisfied the ten years condition, but he cannot consider that the circumstances call for amending legislation.

Consolidated N.H.I. Acts.—Some progress is being made with the projected volume containing the consolidated National Health Insurance Acts and the regulations made thereunder, and also with a revised edition of the *Approved Societies Handbook*. It may be found possible to issue the former volume within the next few months.

Contagious Abortion: Protection of Attested Herds.—On June 26 Sir R. DORMAN-SMITH, replying to Mr. W. Roberts, said that under the powers conferred by Part IV of the Agriculture Act, 1937, a scheme was being framed whereby owners of attested herds would be assisted, by the provision of free veterinary advice and free blood testing, to protect such herds as were already free from abortus infection and to eliminate disease from abortus-infected herds. He hoped to be in a position to introduce the scheme within the next few months.

Treatment for Rheumatism as Additional Benefit.—Dr. Elliot is prepared to consider the granting of approval for the purposes of Additional Benefit No. 16 to any charitable institution which satisfies him it has available diagnostic and other facilities of a high standard for the treatment of rheumatism. He is not at present satisfied that there is a sufficient case for the extension of the benefit to cover treatment at a spa otherwise than in an approved charitable institution.

Notes in Brief

The Government evacuation scheme already applies to eleven areas immediately adjacent to the administrative county of London and to twenty-two provincial areas. Dr. Elliot is reviewing the possibility of extending the scheme to certain further areas. The registers are in general still open to the mothers of children under 5.

On June 20 Mr. Wedderburn told Mr. Gallacher that 4,607 patients were receiving treatment under the tuberculosis schemes of local health authorities in Scotland in sanatoria or other institutions on December 31, 1938.

Dr. Elliott is considering the question of making regulations as to ice-cream after the Food and Drugs Act, 1938, has come into operation on October 1.

Medical News

A series of lectures on the radiology of the skull will be held in the Institute of Clinical Medicine at Antwerp from July 27 to 29. The fee is 300 francs. Further information can be obtained from Dr. R. Thienpont, 30, Avenue Rubens, Antwerp.

The Ninth Imperial Social Hygiene Congress, organized by the British Social Hygiene Council, will be held at B.M.A. House, Tavistock Square, London, from July 10 to 14 inclusive. Medical and social co-operation and social hygiene in practice will be discussed on Wednesday, July 12, and technical, medical, and administrative aspects of venereal disease on July 13, with Sir Arthur MacNalty in the chair. Another aspect of venereal disease problems—methods of ascertaining its incidence in a community—will be dealt with on the afternoon of July 13, with Professor James Young in the chair. On the afternoon of July 14, with Sir Walter Langdon-Brown in the chair, Dr. Cavaillon, Inspector-General of the French Ministry of Public Health, will explain the system of social service which is being developed in connexion with the anti-venereal disease campaign in France. Other topics of medical interest to be discussed are population problems; social and economic barriers to marriage (at which Lord Horder will preside); and a session on the teaching of biology in relation to health and character, and the methods of co-operation in oversea territories in relation to the teaching of nutrition and biology. Oversea nursing will be discussed at an all-day session under the presidency of the Marchioness of Willingdon. The congress is open to all medical men and women, and particulars of registration, fees, etc., can be had from the Secretary, British Social Hygiene Council, Tavistock House South, Tavistock Square, W.C.1.

The Earl of Athlone, Chancellor of the University of London, will open the extensions at Maudsley Hospital, Denmark Hill, S.E., on Friday, July 14, at 3 p.m.

The prizes gained during the academic year at the Middlesex Hospital Medical School will be presented by Sir Edward Mellanby on the afternoon of Thursday, July 20, and Professor W. B. Tuck will give an address, entitled "The Chemical Elements," at 3 p.m.

The King has commanded that the College of Nursing, to which a royal charter was granted in 1928, shall henceforth be known as "The Royal College of Nursing." It was founded in 1916 to provide a central organization for trained nurses, and it has worked to improve the economic and educational status of the nursing profession, and to promote the advance of nursing in all its branches.

By the generosity of the Rockefeller Foundation a Training Fellowship in Psychosomatic Research, tenable at the Tavistock Clinic, of the annual value of £450, will be available for three years from September 1, 1939. Applications are invited from registered medical practitioners of either sex with postgraduate experience in clinical medicine, paediatrics, or physiological research. The successful candidate will receive training in psychotherapy and in the investigation of psychological aspects of general medicine. Application forms and further particulars may be obtained from Dr. A. T. M. Wilson, Tavistock Clinic, Malet Place, London, W.C.1.

The July issue of the *Practitioner* is specially devoted to cancer. It includes an introduction by the Minister of Health, who briefly describes the purposes of the new Cancer Act. There then follow articles on cancer of different parts of the body.

A free course of instruction in the history of medicine will be held at the Institute for the History of Medicine, Berlin, by Professors Diepgen and Zeiss and Drs. Artelt and Heischkel from July 25 to 27. Further information may be obtained from the Institute, Universitätstrasse 3b, Berlin, N.W.7.

A chair of Italian medical hydrology has been founded at the University of Rome and a chair of radiology at the University of Bologna; and on the initiative of the Minister of Public Instruction a chair of criminal anthropology has been created in every Italian university.

The French Government has recently conferred on Dr. G. Gregory Kayne, tuberculosis medical officer for the County of Middlesex, the Order of Palmes d'Officier d'Académie.

EPIDEMIOLOGICAL NOTES

Enteric Fever

In England and Wales notifications of enteric fever rose from 34 to 54, in Scotland they fell from 37 to 7, and in Eire from 32 to 7, while in the administrative county of London the figure was 2, the same as in the previous week. More than a third of the cases in England were recorded in the county of Glamorgan: 13 in Rhondda urban district, 4 in Pontypridd, 2 in Llantrisant and Llantwitfardre, and 1 in Swansea. The Rhondda outbreak, apparently due to paratyphoid, has not yet been traced, and residents have been advised to boil all drinking water and take all necessary precautions with regard to food. The Hawick (Roxburgh) outbreak of paratyphoid fever appears to have ended; 2 cases were notified in the week under review and 1 in the previous week. Cases of typhoid continue to appear in the Kerry district, and are probably the result of contact with primary cases; 4 cases were reported during the week in Dingle Rural District and 1 in Listowel Urban District, while last week there were 4 cases in Dingle and 1 in Killarney Rural District. There have been no further deaths in addition to the 3 previously recorded.

In recent years enteric fever (typhoid and paratyphoid) has shown but slight fluctuations from year to year in Europe and the U.S.A. The year 1937 was an exception in that compared with the previous year there was a slight rise in the U.S.A., Japan, and most countries of Europe, with the exception of Bulgaria, Yugoslavia, and England. During 1938 the incidence was well below that for the previous year in most European countries with the exception of Italy, and in the first quarter of 1939 (compared with the corresponding period of 1938) increases have been recorded in Italy, Bulgaria, and France (in March). Compared with the median values for the years 1927–37 notifications of typhoid fever have declined for 1938 and 1939 in Hungary, Poland, and France, and since March, 1938, in England, and since October, 1938, in Germany (excluding Austria and the Sudeten area).

Quarterly Returns for Scotland and Ireland

Scotland.—According to the Quarterly Return of the Registrar-General for Scotland, 21,429 live births were registered, 469 more than in the previous quarter, while the rate was 17.3 per 1,000 population, 0.6 above that recorded for the preceding quarter. The number of births was 791 less than the average for the last five years, and the rate was 0.8 per 1,000 population below the average for this quarter. The proportion of illegitimate births, 6.0 per cent., was 0.3 above that for the previous quarter, but 0.5 below the five years' average for this quarter of the year. There were 18,995 deaths, or 2,901 more than in the previous quarter, giving the death rate of 15.4 per 1,000 population, or 2.6 more than in the previous quarter and 0.3 lower than the last five years' average. There were 1,890 deaths among children under one year, equivalent to an infant mortality rate of 88 per 1,000 registered live births, 13 more than in the previous quarter, but compared with the last five years' average for this quarter the rate was 7 less. Among legitimate children the mortality was 85 per 1,000 live births compared with 130 among illegitimate ones. Infant mortality for the large burghs was 94, while for the rest of Scotland it was 80; it ranged from 191 in Dumfries, 147 in Port Glasgow, and 144 in Kilmarnock, to 64 in Rutherglen, 58 in Dumbarton, and 57 in Kirkcaldy. Of the 18,995 deaths, 1,154, or 6.1 per cent., were attributed to the principal infectious diseases: influenza 709, whooping-cough 218, diphtheria 110, cerebrospinal fever 27, scarlet fever 18, and measles 2.

Eire.—In Eire 14,207 live births, of which 7,291 were males and 6,916 were females, were registered during the quarter, representing a rate of 19.4 per 1,000 of the estimated population, 0.3 above the rate for this quarter of 1938. Of the total, 439 (3.1 per cent.) were illegitimate. During the quarter there were 13,318 deaths (6,756 males and 6,562 females), equivalent to an annual rate of 18.2 per 1,000 of the estimated population, or 2.6 above the rate for this quarter of 1938. The infant mortality rate was 82 compared with 81 in the previous year. Deaths from the principal infectious diseases represented an annual rate of 0.5 per 1,000 population, the same as in the previous year. Deaths from typhoid fever, measles, scarlet fever, and diphtheria were fewer, but increases were reported in respect of whooping-cough and diarrhoea and enteritis among children under 2 years of age.

Northern Ireland.—In Northern Ireland 6,234 births (3,170 males and 3,064 females) were registered during the quarter, equivalent to an annual rate of 19.3 per 1,000 of the estimated population; this rate is 0.3 below that for the corresponding quarter of 1938 and 0.8 below that for the first quarters of the ten years 1929–38. Of the total, 306 (4.9 per cent.) were illegitimate. During the quarter 5,350 deaths (2,612 males and 2,738 females) were registered, equivalent to an annual rate of 16.5 per 1,000 of the estimated population, or 0.5 above the rate for the corresponding quarter of 1938 and 2.2 below the average rate for the first quarters of the ten years 1929–38. The infant mortality rate was 96 compared with the rate of 106 for the corresponding quarter of the previous year and of 101 for the corresponding quarters of the five preceding years. The urban mortality from the principal epidemic diseases during the quarter was equivalent to an annual rate of 0.9 per 1,000 population, while the rate for the rural areas was 1.3 per 1,000.

No. 25

INFECTIOUS DISEASES AND VITAL STATISTICS

We print below a summary of Infectious Diseases and Vital Statistics in the British Isles during the week ended June 24, 1939.

Figures of Principal Notifiable Diseases for the week and those for the corresponding week last year, for : *(a)* England and Wales (London included). (b) London (administrative county). (c) Scotland. (d) Eire. (e) Northern Ireland. Median values for the last 9 years for (a) and (b).

Figures of Births and Deaths, and of Deaths recorded under each infectious disease, are for : (a) The 126 great towns in England and Wales (including London). (b) London (administrative county). (c) The 16 principal towns in Scotland. (d) The 13 principal towns in Eire. (e) The 10 principal towns in Northern Ireland.

A dash — denotes no cases ; a blank space denotes disease not notifiable or no return available.

Disease	1939					1938 (Corresponding Week)					1930-8 (Median Value Corresponding Weeks)	
	(a)	(b)	(c)	(d)	(e)	(a)	(b)	(c)	(d)	(e)	(a)	(b)
Cerebrospinal fever	20	3	2	2	2	23	2	9	1	—		
Deaths		—	—				1	—	•			
Diphtheria	783	89	187	26	15	989	146	191	41	22	882	153
Deaths	13	1	3	3	1	22	4	6	—	—		
Dysentery	43	21	32		—	39	15	37		—		
Deaths				—	—				—	—		
Encephalitis lethargica, acute	3	2	2	1	—	5	—	—		—		
Deaths		1					2					
Enteric (typhoid and paratyphoid) fever	54	2	7	7	1	20	—	7	3	1	29	
Deaths	—	—	—	1	—	—	—	—	—	—		
Erysipelas		32	65	3	2			55	6	5		
Deaths		1					1					
Infective enteritis or diarrhoea under 2 years												
Deaths	35	7	5	6	6	32	9	11	5	4		
Measles		41	105		4			173		5*		
Deaths	7	—	—	1	—	10	1	—	2	—		
Ophthalmia neonatorum	87	10	23		—	97	10	34		—		
Deaths												
Pneumonia, influenzal§	520	41	1	2	9	758	76	5		33	704	51
Deaths (from influenza)	8	1	2	1	2	20	2	2	1	1		
Pneumonia, primary			145	5				192	11			
Deaths		4		8	8		19		7	14		
Polio-encephalitis, acute	—	—				3	—					
Deaths		—					—					
Poliomyelitis, acute	12	1	—		—	4	—	8		—		
Deaths		—					—					
Puerperal fever	7	7	15		—	1†	1	11	5	—		
Deaths		—					1‡					
Puerperal pyrexia	179	16	14		1	187	20	30		1		
Deaths												
Relapsing fever	—	—			—	—	—			—		
Deaths												
Scarlet fever	1,597	162	233	33	71	1,765	171	355	79	78	1,716	226
Deaths	3	—	1	1	—	3	1	3	—	—		
Small-pox	—	—	—		—	—	—	—		—		
Deaths		—		—	—		—		—	—		
Typhus fever	—	—	—	—	—	—	—	—	—	—		
Deaths				—	—				—	—		
Whooping-cough		316	155		8			123		22		
Deaths	12	3	11	1	1	18	2	4	—	—		
Deaths (0-1 year)	251	36	54	35	18	301	45	58	23	21		
Infant mortality rate (per 1,000 live births)	40	32				49	37					
Deaths (excluding stillbirths)	3,793	655	557	196	125	4,084	789	607	160	130		
Annual death rate (per 1,000 persons living)	9.3	8.4	11.3	13.2	11.0	10.0	10.0	12.4	10.8	11.5		
Live births	6,609	1,096	939	336	264	7,397	1,407	949	396	254		
Annual rate per 1,000 persons living	16.2	14.1	19.0	22.6	23.2	18.2	17.9	19.3	26.8	22.5		
Stillbirths	231	38	39			276	42					
Rate per 1,000 total births (including stillborn)	34	34	40			36	29					

* 2 cases in Belfast alone.
† Puerperal fever was made notifiable only in the administrative county of London, after October 1, 1937.
‡ Death from puerperal sepsis.
§ Includes primary form in figures for England and Wales, London (administrative county), and Northern Ireland.

Letters, Notes, and Answers

All communications in regard to editorial business should be addressed to THE EDITOR, BRITISH MEDICAL JOURNAL, B.M.A. HOUSE, TAVISTOCK SQUARE, W.C.1.

ORIGINAL ARTICLES and LETTERS forwarded for publication are understood to be offered to the *British Medical Journal* alone, unless the contrary be stated. Correspondents who wish notice to be taken of their communications should authenticate them with their names, not necessarily for publication.

Authors desiring REPRINTS of their articles published in the *British Medical Journal* must communicate with the Secretary, B.M.A. House, Tavistock Square, W.C.1, on receipt of proofs. Authors over-seas should indicate on MSS. if reprints are required, as proofs are not sent abroad.

ADVERTISEMENTS.—All communications should be addressed to the Advertisement Manager (office hours 9 a.m. to 5 p.m.). Orders for copies of the *Journal* and communications with reference to subscriptions should be addressed to the Secretary, B.M.A. House.

The TELEPHONE NUMBER of the British Medical Association and the *British Medical Journal* is EUSTON 2111.

The TELEGRAPHIC ADDRESSES are

EDITOR OF THE *BRITISH MEDICAL JOURNAL*, *Aitiology Westcent, London.*

SECRETARY, *Medisecra Westcent, London.*

The address of the B.M.A. Scottish Office is 7, Drumsheugh Gardens, Edinburgh (telegrams: *Associate, Edinburgh;* telephone 24361 Edinburgh), and of the Office of the Cumann Doctúirí na h-Eireann (I.M.A. and B.M.A.), 18, Kildare Street, Dublin (telegrams: *Bacillus, Dublin;* telephone 62550 Dublin.)

QUERIES AND ANSWERS

Excessive Smoking

Dr. W. H. CARTWRIGHT (Dartford, Kent) writes: May I suggest that both the ulcer and the excessive smoking arise as symptoms of an underlying anxiety state. That being so, the excessive smoking *per se* is not of very great importance. Psychological investigation may relieve the anxiety state and concurrently alleviate the ulcer symptoms, the tobacco craving, and other symptoms which are probably present.

Dr. D. BECKIT TRUMAN (Colchester) also writes: May I suggest the following: stuff a clean pipe loosely with cotton-wool and drop on a few drops of peppermint. Smoke without lighting whenever the patient wishes.

"J. A. W." writes: "R. R." may find the following hint I read in the *Journal* many years ago helpful. The patient, having just finished a cigarette, washes out his mouth with 0.25 per cent. solution of silver nitrate. This is so unpleasant that further desire is killed. The original instruction was 2.5 per cent., but was promptly corrected next week to 0.25 per cent. Having been a heavy smoker myself, I can assure "R. R." that the best method of all is to cut it off completely once and for all.

Aeronautics and Persistent Hiccup

Dr. H. W. SWANN (London, S.E.17) writes: The following case which I had to treat recently might be of interest. A gentleman aged 68 was flying from Australia to England. Just before he reached Alexandria he felt very ill and developed gastric symptoms, with a high temperature, a papular rash on his arms, and persistent hiccup. He had to break his journey at Alexandria and was kept there in bed a few days. The temperature and rash disappeared, but the hiccup persisted. In spite of that he came over to London by air. When I saw him the day he got to England the only symptom was hiccup, which was continuous and very exhausting as it prevented him from getting any sleep. I gave him large doses of kaolin, potassium bromide, and belladonna, also a mixture of sp. ammon. aromat., sp. menth. pip., sp. chlorof., and sp. cajuput., and 1/75 grain of atropine sulphate subcutaneously once daily. The hiccup began to disappear only after eight days of treatment, and at the end of fourteen days he was completely cured. I should be much interested to know whether similar cases of persistent hiccup due to flying have been reported, and whether I should advise this patient to refrain from flying in the future, as this would be likely to set up a recurrence of the attack.

Income Tax

Employment and Subsequent Practice

"J. B." acted as an assistant from September, 1938, to February, 1939, and purchased a practice as from March 1, 1939.

*** So far as the year to April 5, 1939, is concerned, any liability will probably be covered by the earned income relief plus the married man's allowance of £180. It is, however, not possible to deal finally with the matter, because his income from the practice for the month of March will be calculated as 1/12 of his income to February 29, 1940, or 1/10 of the income to December 31, 1939, if that is more convenient. The form he has received relates to the employment, and we advise him to complete it, stating the gross earnings (£192) and claiming to deduct 5/12 of 22 per cent. of £60 in respect of car depreciation, as well as licence, etc., and running costs, and mentioning in the *total* income declaration the address of his present practice and the date from which he took it over. When he makes up his accounts—for example, at February 29, 1940—he can then make a further declaration for 1938-9 and 1939-40. The expense of setting himself up in practice—including acquisition of instruments, etc.—is capital outlay. An additional £45 personal allowance can be claimed against the wife's separate earnings.

LETTERS, NOTES, ETC.

Injuries by Lightning

Dr. F. R. HUMPHREYS (15, Denton Road, Wokingham, Berks) writes on behalf of the British Thunderstorm Survey: May I beg the assistance of your readers in obtaining information concerning cases of injury by lightning or electric current to human beings (also to animals). In the Press notices about such happenings give little information as to the personal injury sustained. This is required to complete the investigation. Full information on all lightning strokes is desired and should be sent to me. I am undertaking this part of the investigation. No publicity will be given to individual cases, and the information furnished will only be used for scientific records.

Pellagra

Dr. G. ARBOUR STEPHENS (Swansea) writes: The article dealing with a case of pellagra by Drs. J. G. Greenfield and J. MacDonald Holmes (*Journal*, April 22, p. 815) is of great interest and induces me to refer to an excellent description of this disease in the Welsh Mabinogion-stories, translated by Lady Guest, under the heading of "Lludd and Llev-elys." In that tale we are told that the second plague used to come on every May Day over every hearth in the island. The men lost their hue and their strength, the women lost their children, the young women and men lost their senses, and all the animals and trees and the earth and the waters were left barren. From this we are led to infer that this disease was undoubtedly a deficiency disease caused by poor food, because we are told that every hearth was affected. What disease can we consider as being responsible for an attack on persons, animals, trees, and soil? Where did the disease start? It seems as if the soil was the first to be attacked, because the trees and the animals fed on the soil were affected, and this suggestion is supported by the treatment suggested by Llev-elys—namely, that a big hole should be dug in the soil, in which should be placed a cauldron of mead, when two dragons would fight in the air. The "two dragons" were a spectacular inducement for the people to dig holes and by so doing bring up and scatter fresh soil with a fresh supply of salts and other essential elements. In the Midland counties it is still the practice for farmers to dig these holes in order to obtain fresh soil, and this practice may have continued from the time when the Celts exercised full sway over these parts. This Mabinogion tale was written at least 1,600 years ago.

"Practical Child Psychotherapy"

The book by Dr. Curt Boenheim with this title, reviewed in our issue of June 10 (p. 1182), was originally published in German some time ago. Some of the points the reviewer stressed would be explained by the fact that the book, now published by John Bale Medical Publications Ltd., is an English translation.